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AGREEMENT

CONCERNING THE ADOPTION OF UNIFORM CONDITIONS OF APPROVAL AND RECIPROCAL RECOGNITION OF APPROVAL FOR MOTOR VEHICLE EQUIPMENT AND PARTS

done at Geneva on 20 March 1958

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UNIFORM PROVISIONS CONCERNING THE APPROVAL OF VEHICLES WITH REGARD TO THE PROTECTION OF THE OCCUPANTS IN THE EVENT OF A LATERAL COLLISION

UNITED NATIONS

Regulation No. 95

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF VEHICLES WITH REGARD TO THE PROTECTION OF THE OCCUPANTS IN THE EVENT OF A LATERAL COLLISION

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1. SCOPE

This Regulation applies to the lateral collision behaviour of the structure of the passenger compartment of M_1 and N_1 categories of vehicles where the R point of the lowest seat is not more than 700 mm from ground level when the vehicle is in the condition corresponding to the reference mass defined in paragraph 2.10. of this Regulation.

2. DEFINITIONS

For the purposes of this Regulation:

2.1. "Approval of a vehicle" means the approval of a vehicle type with regard to the behaviour of the structure of the passenger compartment in a lateral collision;

2.2. "Vehicle type" means a category of power-driven vehicles which do not differ in such essential respects as:

2.2.1. the length, width and ground clearance of the vehicle, in so far as they have a negative effect on the performance prescribed in this Regulation;

2.2.2. the structure, dimensions, lines and materials of the side walls of the passenger compartment in so far as they have a negative effect on the performance prescribed in this Regulation;

2.2.3. the lines and inside dimensions of the passenger compartment and the type of protective systems, in so far as they have a negative effect on the performance prescribed in this Regulation;

2.2.4. the siting of the engine (front, rear or centre);

2.2.5. the unladen mass, in so far as there is a negative effect on the performance prescribed in this Regulation;

2.2.6. the optional arrangements or interior fittings in so far as they have a negative effect on the performance prescribed in this Regulation;

2.2.7. the type of front seat(s) and position of the "R" point in so far as they have a negative effect on the performance prescribed in this Regulation;

2.3. "Passenger compartment" means the space for occupant accommodation, bounded by the roof, floor, side walls, doors, outside glazing and front bulkhead and the plane of the rear compartment bulkhead or the plane of the rear-seat back support;

2.4. "R point" or "seating reference point" means the reference point specified by the vehicle manufacturer which:

2.4.1. has co-ordinates determined in relation to the vehicle structure;

2.4.2. corresponds to the theoretical position of the point of torso/thighs rotation (H point) for the lowest and most rearward normal driving position or position of use given by the vehicle manufacturer for each seating position specified by him;

2.5. "H point" is as established by annex 3 to this Regulation;

2.6. "Capacity of the fuel tank" means the fuel-tank capacity as specified by the manufacturer of the vehicle;

2.7. "Transverse plane" means a vertical plane perpendicular to the median longitudinal vertical plane of the vehicle;

2.8. "Protective system" means devices intended to restrain and/or protect the occupants;

2.9. "Type of protective system" means a category of protective devices which do not differ in such essential respects as their:

technology
geometry
constituent materials;

2.10. "Reference mass" means the unladen mass of the vehicle increased by a mass of 100 kg (that is the mass of the side impact dummy and its instrumentation);

2.11. "Unladen mass" means the mass of the vehicle in running order without driver, passengers or load, but with the fuel tank full and the usual set of tools and spare wheel on board, where applicable;

2.12. "Mobile deformable barrier" means the apparatus with which the test vehicle is impacted. It consists of a trolley and an impactor;

2.13. "Impactor" means a crushable section mounted on the front of mobile deformable barrier;

2.14. "Trolley" means a wheeled frame free to travel along its longitudinal axis at the point of impact. Its front part supports the impactor.

3. APPLICATION FOR APPROVAL

3.1. The application for approval of a vehicle type with regard to the protection of the occupants in the event of a lateral collision shall be submitted by the vehicle manufacturer or by his duly accredited representative.

3.2. It shall be accompanied by the undermentioned documents in triplicate and the following particulars:

3.2.1. a detailed description of the vehicle type with respect to its structure, dimensions, lines and constitutent materials;

3.2.2. photographs and/or diagrams and drawings of the vehicle showing the vehicle type in front, side and rear elevation and design details of the lateral part of the structure;

3.2.3. particulars of the vehicle's mass as defined by paragraph 2.11. of this Regulation;

3.2.4. the lines and inside dimensions of the passenger compartment;

3.2.5. a description of the relevant side interior fittings and protective systems installed in the vehicle.

3.3. The applicant for approval shall be entitled to present any data and results of tests carried out which make it possible to establish that compliance with the requirements can be achieved on prototype vehicles with a sufficient degree of accuracy.

3.4. A vehicle which is representative of the type to be approved shall be submitted to the technical service responsible for conducting the approval tests.

3.4.1. A vehicle not ccmprising all the components proper to the type may be accepted for tests provided that it can be shown that the absence of the components omitted has no detrimental effect on the performance prescribed in the requirements of this Regulation.

3.4.2. It shall be the responsibility of the applicant for approval to show that the application of paragraph 3.4.1 is in compliance with the requirements of this Regulation.

3.5. The competent authority shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.

4. APPROVAL

4.1. If the vehicle type submitted for approval pursuant to this Regulation meets the requirements of paragraph 5 below, approval of that vehicle type shall be granted.

4.2. In case of doubt, account shall be taken, when verifying the conformity of the vehicle to the requirements of this Regulation, of any data or test results provided by the manufacturer which can be taken into consideration in validating the approval test carried out by the technical service.

4.3. An aproval number shall be assigned to each type approved. Its first two digits (at present 00 for the Regulation in its original form) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at

the time of issue of the approval. The same Contracting Party may not assign the same approval number to another vehicle type.

4.4. Notice of approval or of extension or of refusal of approval of a vehicle type pursuant to this Regulation shall be communicated by the Parties to the Agreement applying this Regulation by means of a form conforming to the model in annex 1 to this Regulation and photographs and/or diagrams and drawings supplied by the applicant for approval, in a format not exceeding A4 (210 x 297) mm or folded to that format and on an appropriate scale.

4.5. There shall be affixed to every vehicle conforming to a vehicle type approved under this Regulation, conspicuously and in a readily accessible place specified on the approval form, an international approval mark consisting of:

4.5.1. a circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval; 1/

4.5.2. the number of this Regulation, followed by the letter "R", a dash and the approval number, to the right of the circle prescribed in paragraph 4.5.1.

4.6. If the vehicle conforms to a vehicle type approved, under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.5.1. need not be repeated; in this case the Regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.5.1.

4.7. The approval mark shall be clearly legible and shall be indelible.

4.8. The approval mark shall be placed close to or on the vehicle data plate affixed by the manufacturer.

1/ 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 (vacant), 25 for Croatia, 26 for Slovenia, 27 for Slovakia, 28 for Belarus and 29 for Estonia. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify the Agreement Concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, or in which they accede to that Agreement, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

4.9. Annex 2 to this Regulation gives examples of approval marks.

5. SPECIFICATIONS AND TESTS

5.1. The vehicle shall undergo a test in accordance with annex 4 to this Regulation.

5.1.1. The test will be carried out on the driver's side unless asymmetric side structures, if any, are so different as to affect the performance in a side impact. In that case either of the alternatives in paragraph 5.1.1.1. or 5.1.1.2. may be used by agreement between the manufacturer and test authority.

5.1.1.1. The manufacturer will provide the authority responsible for approval with information regarding the compatibility of performances in comparison with the driver's side when the test is being carried out on that side.

5.1.1.2. The approval authority, if concerned as to the construction of the vehicle, will decide to have the test performed on the side opposite the driver, this being considered the least favourable.

5.1.2. The Technical Service, after consultation with the manufacturer, may require the test to be carried out with the seat in a position other than the one indicated in paragraph 5.5. of annex 4. This position shall be indicated in the test report. 2/

5.1.3. The result of this test shall be considered satisfactory if the conditions set out in paragraphs 5.2. and 5.3. below are satisfied.

5.2. Performance criteria

5.2.1. The performance criteria, as determined for the collision test in accordance with the appendix to annex 4 to this Regulation shall meet the following conditions:

5.2.1.1. the head performance criterion (HPC) shall be less than or equal to 1,000; when there is no head contact, then the HPC shall not be measured or calculated but recorded as "No Head Contact."

2/ Until 30 September 1998, for the purposes of the test requirements, the range of normal longitudinal adjustments shall be limited such that the H-point lies within the length of the door aperture.

5.2.1.2. the thorax performance criteria shall be:

(a) Rib Deflection Criterion (RDC) less than or equal to 42 mm;

(b) Soft Tissue Criterion (VC) less or equal to 1.0 m/sec.

For a transitional period of two years after the entry into force of this Regulation the VC value is not a pass/fail criterion for the approval testing, but this value has to be recorded in the test report and to be collected by the approval authorities. After this transitional period, the VC value of 1.0 m/sec shall apply as a pass/fail criterion unless the Contracting Parties applying this Regulation decide otherwise.

5.2.1.3. the pelvis performance criterion shall be:

Pubic Symphysis Peak Force (PSPF) less than or equal to 6 kN.

5.2.1.4. the abdomen performance criterion shall be:

Abdominal Peak Force (APF) less than or equal to 2.5 kN internal force (equivalent to external force of 4.5 kN).

5.3. Particular requirements

5.3.1. No door shall open during the test.

5.3.2. After the impact, it shall be possible without the use of tools to:

5.3.2.1. open a sufficient number of doors provided for normal entry and exit of passengers to allow evacuation of all occupants;

5.3.2.2. release the dummy from the protective system;

5.3.2.3. remove the dummy from the vehicle;

5.3.3. no interior device or component shall become detached in such a way as noticeably to increase the risk of injury from sharp projections or jagged edges;

5.3.4. ruptures, resulting from permanent deformation are acceptable, provided these do not increase the risk of injury;

5.3.5. if there is continuous leakage of liquid from the fuel-feed installation after the collision, the rate of leakage shall not exceed 30 g/min; if the liquid from the fuel-feed system mixes with liquids from the other systems and the various liquids cannot easily be separated and identified, all the liquids collected shall be taken into account in evaluating the continuous leakage.

6. MODIFICATION OF THE VEHICLE TYPE

6.1. Any modification affecting the structure, the number and type of seats, the interior trim or fittings, or the position of the vehicle controls or of mechanical parts which might affect the energy-absorption capacity of the side of the vehicle, shall be brought to the notice of the administrative department granting approval. The department may then either:

6.1.1. consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the vehicle still complies with the requirements, or

6.1.2. require a further test report from the technical service responsible for conducting the tests;

6.1.2.1. Any modification of the vehicle affecting the general form of the structure of the vehicle or any variation in the reference mass greater than 8 per cent which in the judgement of the authority would have a marked influence on the results of the test shall require a repetition of the test as described in annex 4.

6.1.2.2. If the technical service, after consultation with the vehicle manufacturer, considers that modifications to a vehicle type are insufficient to warrant a complete retest then a partial test may be used. This would be the case if the reference mass is not more than 8 per cent different from the original vehicle or the number of front seats is unchanged. Variations of seat type or interior fittings need not automatically entail a full retest. An example of the approach to this problem is given in annex 8.

6.2. Confirmation or refusal of approval, specifying the alteration, shall be communicated by the procedure specified in paragraph 4.4. above to the Parties to the Agreement which apply this Regulation.

6.3. The competent authority issuing an extension of approval shall assign a series number to each communication form drawn up for such an extension.

7. CONFORMITY OF PRODUCTION

7.1. Every vehicle approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set out in paragraph 5 above.

7.2. In order to verify that the requirements of paragraph 7.1. are met, suitable checks of the production shall be carried out.

7.3. The holder of the approval shall, in particular:

7.3.1. ensure existence of procedures for effective quality control of the vehicle;

7.3.2. have access to the testing equipment necessary for checking conformity to each approved type;

7.3.3. ensure that test result data are recorded and that the annexed documents remain available for a period to be determined in agreement with the administrative department;

7.3.4. analyze the results of each type of test, in order to verify and ensure the consistency of characteristics of the vehicle, making allowance for permissible variations in industrial production;

7.3.5. ensure that for each type of vehicle at least the tests concerning the taking of measurements are carried out;

7.3.6. ensure that any set of samples or test pieces giving evidence of non-conformity in the type of test in question shall give rise to a further sampling and test. All necessary steps shall be taken to restore conformity of the corresponding production.

7.4. The competent authority which has granted type approval may at any time verify the conformity control methods applied in each production unit.

7.4.1. At every inspection, the test records and production records shall be presented to the visiting inspector.

7.4.2. The inspector may select samples at random to be tested in the manufacturer's laboratory. The minimum number of samples may be determined according to the results of the manufacturer's own checks.

7.4.3. Where the quality level appears unsatisfactory or it seems necessary to verify the validity of the tests carried out in application of paragraph 7.4.2., the inspector shall select samples to be sent to the technical service which conducted the type approval tests.

7.4.4. The competent authority may carry out any test prescribed in this Regulation. The normal frequency of inspections authorized by the competent authority shall be one every two years. In cases where unsatisfactory results are found during one of these inspections, the competent authority shall ensure that all necessary steps are taken to restore conformity of production as rapidly as possible.

8. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

8.1. The approval granted in respect of a vehicle type, pursuant to this Regulation, may be withdrawn if the requirement laid down in paragraph 7.1. above is not complied with, or if the vehicle or vehicles selected have failed to pass the checks prescribed in paragraph 7.2. above.

8.2. If a Contracting Party to the Agreement applying this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation by means of a communication form conforming to the model in annex 1 to this Regulation.

9. PRODUCTION DEFINITELY DISCONTINUED

If the holder of the approval completely ceases to manufacture a type of vehicle approved in accordance with this Regulation, he shall so inform the authority which granted the approval. Upon receiving the relevant communication that authority shall inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in annex 1 to this Regulation.

10. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

The Contracting Parties to the Agreement applying this Regulation shall communicate to the United Nations secretariat the names and addresses of the technical services responsible for conducting approval tests, and of the administrative departments which grant approval and to which forms certifying approval or extension, or refusal or withdrawal of approval, issued in other countries, are to be sent.

Annex 1

(maximum format: A4 (210 x 297 mm))

COMMUNICATION

issued by: Name of administration:
.....
.....
.....

concerning: 2/ APPROVAL GRANTED
APPROVAL EXTENDED
APPROVAL REFUSED
APPROVAL WITHDRAWN
PRODUCTION DEFINITELY DISCONTINUED

of a vehicle type with regard to protection of occupants in the event of a lateral collision pursuant to Regulation No. 95

Approval No. ... Extension No. ...

1. Trade name or mark of the power-driven vehicle .....

2. Vehicle type.....

3. Manufacturer's name and address.....

4. If applicable, name and address of manufacturer's representative.....
.....

5. Vehicle submitted for approval on.....

6. Technical service responsible for conducting approval tests.....
.....

7. Date of test report.....

8. Number of test report.....

9. Approval granted/refused/extended/withdrawn.2/

10. Position of approval mark on the vehicle.....

11. Place.....

12. Date.....

13. Signature.....

14. The list of documents deposited with the Administrative Service which has granted approval is annexed to this communication and may be obtained on request.

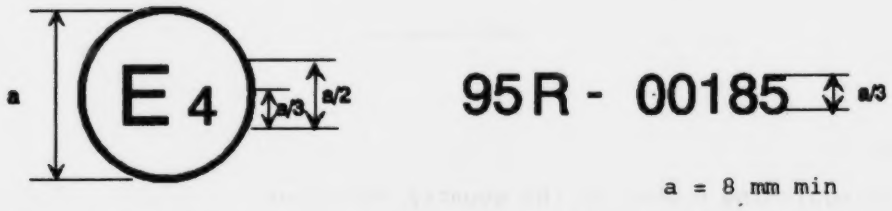
1/ Distinguishing number of the country which has granted/extended/refused/withdrawn approval (see approval provisions in the Regulation).

2/ Strike out what does not apply.

Annex 2

ARRANGEMENTS OF THE APPROVAL MARK

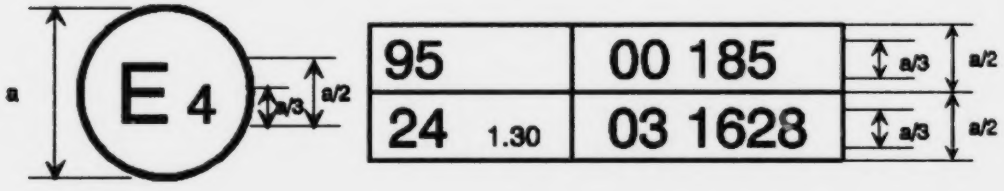
Model A
(See paragraph 4.5. of this Regulation)



a = 8 mm min

The above approval mark affixed to a vehicle shows that the vehicle type concerned has, with regard to the protection of the occupants in the event of a lateral collision, been approved in the Netherlands (E4) pursuant to Regulation No. 95. The first two approval numbers "00" indicate that when the approval was granted Regulation No. 95 was in its original form.

Model B
(See paragraph 4.6. of this Regulation)



a = 8 mm min

The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E4) pursuant to Regulations Nos. 95 and 24 */. (In the case of the latter Regulation, the additional symbol which follows the Regulation number indicates that the corrected absorption co-efficient is 1.30 m^{-1}). The first two approval numbers indicate that at the date when the respective approvals were granted Regulation 95 was in its original form and Regulation No. 24 incorporated the 03 series of amendments.

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*/ The latter number is given only as an example.

Annex 3

PROCEDURE FOR DETERMINING THE "H" POINT AND THE ACTUAL TORSO ANGLE FOR SEATING POSITIONS IN MOTOR VEHICLES

1. PURPOSE

The procedure described in this annex is used to establish the "H" point location and the actual torso angle for one or several seating positions in a motor vehicle and to verify the relationship of measured data to design specifications given by the vehicle manufacturer. 1/

2. DEFINITIONS

For the purposes of this annex:

2.1. "Reference data" means one or several of the following characteristics of a seating position:

2.1.1. the "H" point and the "R" point and their relationship,

2.1.2. the actual torso angle and the design torso angle and their relationship.

2.2. "Three-dimensional 'H' point machine" (3-D H machine) means the device used for the determination of "H" points and actual torso angles. This device is described in appendix 1 to this annex;

2.3. "'H' point" means the pivot centre of the torso and the thigh of the 3-D H machine installed in the vehicle seat in accordance with paragraph 4 below. The "H" point is located in the centre of the centreline of the device which is between the "H" point sight buttons on either side of the 3-D H machine. The "H" point corresponds theoretically to the "R" point (for tolerances see paragraph 3.2.2. below). Once determined in accordance with the procedure described in paragraph 4, the "H" point is considered fixed in relation to the seat-cushion structure and to move with it when the seat is adjusted;

2.4. "'R' point" or "seating reference point" means a design point defined by the vehicle manufacturer for each seating position and established with respect to the three-dimensional reference system;

2.5. "Torso-line" means the centreline of the probe of the 3-D H machine with the probe in the fully rearward position;

1/ In any seating position other than front seats where the "H" point cannot be determined using the "Three-dimensional 'H' point machine" or procedures, the "R" point indicated by the manufacturer may be taken as a reference at the discretion of the competent authority.

2.6. "Actual torso angle" means the angle measured between a vertical line through the "H" point and the torso line using the back angle quadrant on the 3-D H machine. The actual torso angle corresponds theoretically to the design torso angle (for tolerances see paragraph 3.2.2. below):

2.7. "Design torso angle" means the angle measures between a vertical line through the "R" point and the torso line in a position which corresponds to the design position of the seat-back established by the vehicle manufacturer;

2.8. "Centreplane of occupant" (C/LO) means the median plane of the 3-D H machine positioned in each designated seating position; it is represented by the co-ordinate of the "H" point on the "Y" axis. For individual seats, the centreplane of the seat coincides with the centreplane of the occupant. For other seats, the centreplane of the occupant is specified by the manufacturer;

2.9. "Three-dimensional reference system" means a system as described in appendix 2 to this annex;

2.10. "Fiducial marks" are physical points (holes, surfaces, marks or indentations) on the vehicle body as defined by the manufacturer;

2.11. "Vehicle measuring attitude" means the position of the vehicle as defined by the co-ordinates of fiducial marks in the three-dimensional reference system.

3. REQUIREMENTS

3.1. Data presentation

For each seating position where reference data are required in order to demonstrate compliance with the provisions of the present Regulation, all or an appropriate selection of the following data shall be presented in the form indicated in appendix 3 to this annex:

3.1.1. the co-ordinates of the "R" point relative to the three-dimensional reference system;

3.1.2. the design torso angle;

3.1.3. all indications necessary to adjust the seat (if it is adjustable) to the measuring position set out in paragraph 4.3. below.

3.2. Relationship between measured data and design specifications

3.2.1. The co-ordinates of the "H" point and the value of the actual torso angle obtained by the procedure set out in paragraph 4. below shall be compared, respectively, with the co-ordinates of the "R" point

and the value of the design torso angle indicated by the vehicle manufacturer.

3.2.2. The relative positions of the "R" point and the "H" point and the relationship between the design torso angle and the actual torso angle shall be considered satisfactory for the seating position in question if the "H" point, as defined by its co-ordinates, lies within a square of 50 mm side length with horizontal and vertical sides whose diagonals intersect at the "R" point, and if the actual torso angle is within 5° of the design torso angle.

3.2.3. If these conditions are met, the "R" point and the design torso angle, shall be used to demonstrate compliance with the provisions of this Regulation.

3.2.4. If the "H" point or the actual torso angle does not satisfy the requirements of paragraph 3.2.2. above, the "H" point and the actual torso angle shall be determined twice more (three times in all). If the results of two of these three operations satisfy the requirements, the conditions of paragraph 3.2.3. above shall apply.

3.2.5. If the results of at least two of the three operations described in paragraph 3.2.4. above do not satisfy the requirements of paragraph 3.2.2. above, or if the verification cannot take place because the vehicle manufacturer has failed to supply information regarding the position of the "R" point or regarding the design torso angle, the centroid of the three measured points or the average of the three measured angles shall be used and be regarded as applicable in all cases where the "R" point or the design torso angle is referred to in this Regulation.

4. PROCEDURE FOR "H" POINT AND ACTUAL TORSO ANGLE DETERMINATION

4.1. The vehicle shall be preconditioned at the manufacturer's discretion, at a temperature of 20 ± 10°C to ensure that the seat material reached room temperature. If the seat to be checked has never been sat upon, a 70 to 80 kg person or device shall sit on the seat twice for one minute to flex the cushion and back. At the manufacturer's request, all seat assemblies shall remain unloaded for a minimum period of 30 min prior to installation of the 3-D H machine.

4.2. The vehicle shall be at the measuring attitude defined in paragraph 2.11. above.

4.3. The seat, if it is adjustable, shall be adjusted first to the rearmost normal driving or riding position, as indicated by the vehicle manufacturer, taking into consideration only the longitudinal adjustment of the seat, excluding seat travel used for purposes other than normal driving or riding positions. Where other modes of seat adjustment exist (vertical, angular, seat-back, etc.) these will then be adjusted to the position specified by the

vehicle manufacturer. For suspension seats, the vertical position shall be rigidly fixed corresponding to a normal driving position as specified by the manufacturer.

4.4. The area of the seating position contacted by the 3-D H machine shall be covered by a muslin cotton, of sufficient size and appropriate texture, described as a plain cotton fabric having 18.9 threads per cm^2 and weighing 0.228 kg/m^2 or knitted or non-woven fabric having equivalent characteristics. If the test is run on a seat outside the vehicle, the floor on which the seat is placed shall have the same essential characteristics 2/ as the floor of the vehicle in which the seat is intended to be used.

4.5. Place the seat and back assembly of the 3-D H machine so that the centreplane of the occupant (C/LO) coincides with the centreplane of the 3-D H machine. At the manufacturer's request, the 3-D H machine may be moved inboard with respect to the C/LO if the 3-D H machine is located so far outboard that the seat edge will not permit levelling of the 3-D H machine.

4.6. Attach the foot and lower leg assemblies to the seat pan assembly, either individually or by using the T-bar and lower leg assembly. A line through the "H" point sight buttons shall be parallel to the ground and perpendicular to the longitudinal centreplane of the seat.

4.7. Adjust the feet and leg positions of the 3-D H machine as follows:

4.7.1. Designated seating position: driver and outside front passenger

4.7.1.1. Both feet and leg assemblies shall be moved forward in such a way that the feet take up natural positions on the floor, between the operating pedals if necessary. Where possible the left foot shall be located approximately the same distance to the left of the centreplane of the 3-D H machine as the right foot is to the right. The spirit level verifying the transverse orientation of the 3-D H machine is brought to the horizontal by readjustment of the seat pan if necessary, or by adjusting the leg and foot assemblies towards the rear. The line passing through the "H" point sight buttons shall be maintained perpendicular to the longitudinal centreplane of the seat.

4.7.1.2. If the left leg cannot be kept parallel to the right leg and the left foot cannot be supported by the structure, move the left foot until it is supported. The alignment of the sight buttons shall be maintained.

2/ Tilt angle, height difference with a seat mounting, surface texture, etc.

4.7.2. Designated seating position: outboard rear

For rear seats or auxiliary seats, the legs are located as specified by the manufacturer. If the feet then rest on parts of the floor which are at different levels, the foot which first comes into contact with the front seat shall serve as a reference and the other foot shall be so arranged that the spirit level giving the transverse orientation of the seat of the device indicates the horizontal.

4.7.3. Other designated seating positions:

The general procedure indicated in paragraph 4.7.1. above shall be followed except that the feet shall be placed as specified by the vehicle manufacturer.

4.8. Apply lower leg and thigh weights and level the 3-D H machine.

4.9. Tilt the back pan forward against the forward stop and draw the 3-D H machine away from the seat-back using the T-bar. Reposition the 3-D H machine on the seat by one of the following methods:

4.9.1. If the 3-D H machine tends to slide rearward, use the following procedure. Allow the 3-D H machine to slide rearward until a forward horizontal restraining load on the T-bar is no longer required i.e. until the seat pan contacts the seat-back. If necessary, reposition the lower leg.

4.9.2. If the 3-D H machine does not tend to slide rearward, use the following procedure. Slide the 3-D H machine rearwards by applying a horizontal rearward load to the T-bar until the seat pan contacts the seat-back (see figure 2 of appendix 1 to this annex).

4.10. Apply a 100 ± 10 N load to the back and pan assembly of the 3-D H machine at the intersection of the hip angle quadrant and the T-bar housing. The direction of load application shall be maintained along a line passing by the above intersection to a point just above the thigh bar housing (see figure 2 of appendix 1 to this annex). Then carefully return the back pan to the seat-back. Care must be exercised throughout the remainder of the procedure to prevent the 3-D H machine from sliding forward.

4.11. Install the right and left buttock weights and then, alternately, the eight torso weights.
Maintain the 3-D H machine level.

4.12. Tilt the back pan forward to release the tension on the seat-back. Rock the 3-D H machine from side to side through a 10° arc (5° to each side of the vertical centreplane) for three complete cycles to release any accumulated friction between the 3-D H machine and the seat.

During the rocking action, the T-bar of the 3-D H machine may tend to diverge from the specified horizontal and vertical alignment. The T-bar must therefore be restrained by applying an appropriate lateral load during the rocking motions. Care shall be exercised in holding the T-bar and rocking the 3-D H machine to ensure that no inadvertent exterior loads are applied in a vertical or fore and aft direction.

The feet of the 3-D H machine are not to be restrained or held during this step. If the feet change position, they should be allowed to remain in that attitude for the moment.

Carefully return the back pan to the seat-back and check the two spirits levels for zero position. If any movement of the feet has occurred during the rocking operation of the 3-D H machine, they must be repositioned as follows:

Alternately, lift each foot off the floor the minimum necessary amount until no additional foot movement is obtained. During this lifting, the feet are to be free to rotate; and no forward or lateral loads are to be applied. When each foot is placed back in the down position, the heel is to be in contact with the structure designed for this.

Check the lateral spirit level for zero position; if necessary, apply a lateral load to the top of the back pan sufficient to level the 3-D H machine's seat pan on the seat.

4.13. Holding the T-bar to prevent the 3-D H machine from sliding forward on the seat cushion, proceed as follows:

(a) return the back pan to the seat-back;

(b) alternately apply and release a horizontal rearward load, not to exceed 25 N, to the back angle bar at a height approximately at the centre of the torso weights until the hip angle quadrant indicates that a stable position has been reached after load release. Care shall be exercised to ensure that no exterior downward or lateral loads are applied to the 3-D H machine. If another level adjustment of the 3-D H machine is necessary, rotate the back pan forward, re-level, and repeat the procedure from paragraph 4.12.

4.14. Take all measurements:

4.14.1. The co-ordinates of the "H" point are measured with respect to the three-dimensional reference system.

4.14.2. The actual torso angle is read at the back angle quadrant of the 3-D H machine with the probe in its fully rearward position.

4.15. If a re-run of the installation of the 3-D H machine is desired, the seat assembly should remain unloaded for a minimum period of 30 min prior to the re-run. The 3-D H machine should not be left loaded on the seat assembly longer than the time required to perform the test.

4.16. If the seats in the same row can be regarded as similar (bench seat, identical seats, etc.) only one "H" point and one "actual torso angle" shall be determined for each row of seats, the 3-D H machine described in appendix 1 to this annex being seated in a place regarded as representative for the row. This place shall be:

4.16.1. in the case of the front row, the driver's seat;

4.16.2. in the case of the rear row or rows, an outer seat.

Annex 3 - Appendix 1

DESCRIPTION OF THE THREE DIMENSIONAL "H" POINT MACHINE */

(3-D H machine)

1. Back and seat pans

The back and seat pans are constructed of reinforced plastic and metal; they simulate the human torso and thigh and are mechanically hinged at the "H" point. A quadrant is fastened to the probe hinged at the "H" point to measure the actual torso angle. An adjustable thigh bar, attached to the seat pan, establishes the thigh centreline and serves as a baseline for the hip angle quadrant.

2. Body and leg elements

Lower leg segments are connected to the seat pan assembly at the T-bar joining the knees, which is a lateral extension of the adjustable thigh bar. Quadrants are incorporated in the lower leg segments to measure knee angles. Shoe and foot assemblies are calibrated to measure the foot angle. Two spirit levels orient the device in space. Body element weights are placed at the corresponding centres of gravity to provide seat penetration equivalent to a 76 kg male. All joints of the 3-D H machine should be checked for free movement without encountering noticeable friction.

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*/ For details of the construction of the 3-D H machine refer to Society of Automobile Engineers (SAE), 400 Commonwealth Drive, Warrendale, Pennsylvania 15096, United States of America.

The machine corresponds to that described in ISO Standard 6549-1980.

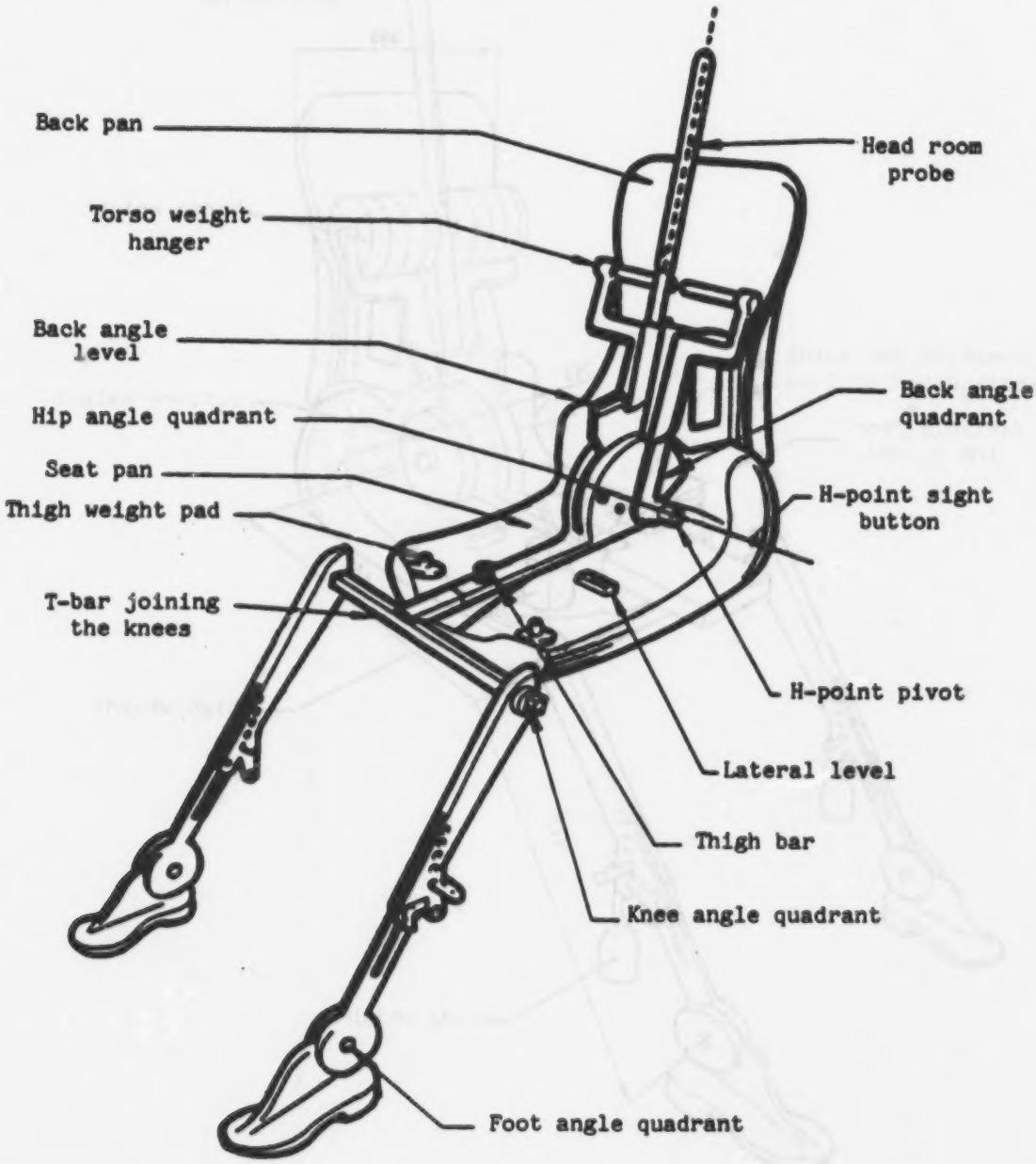

Figure 1 - 3-D H machine elements designation

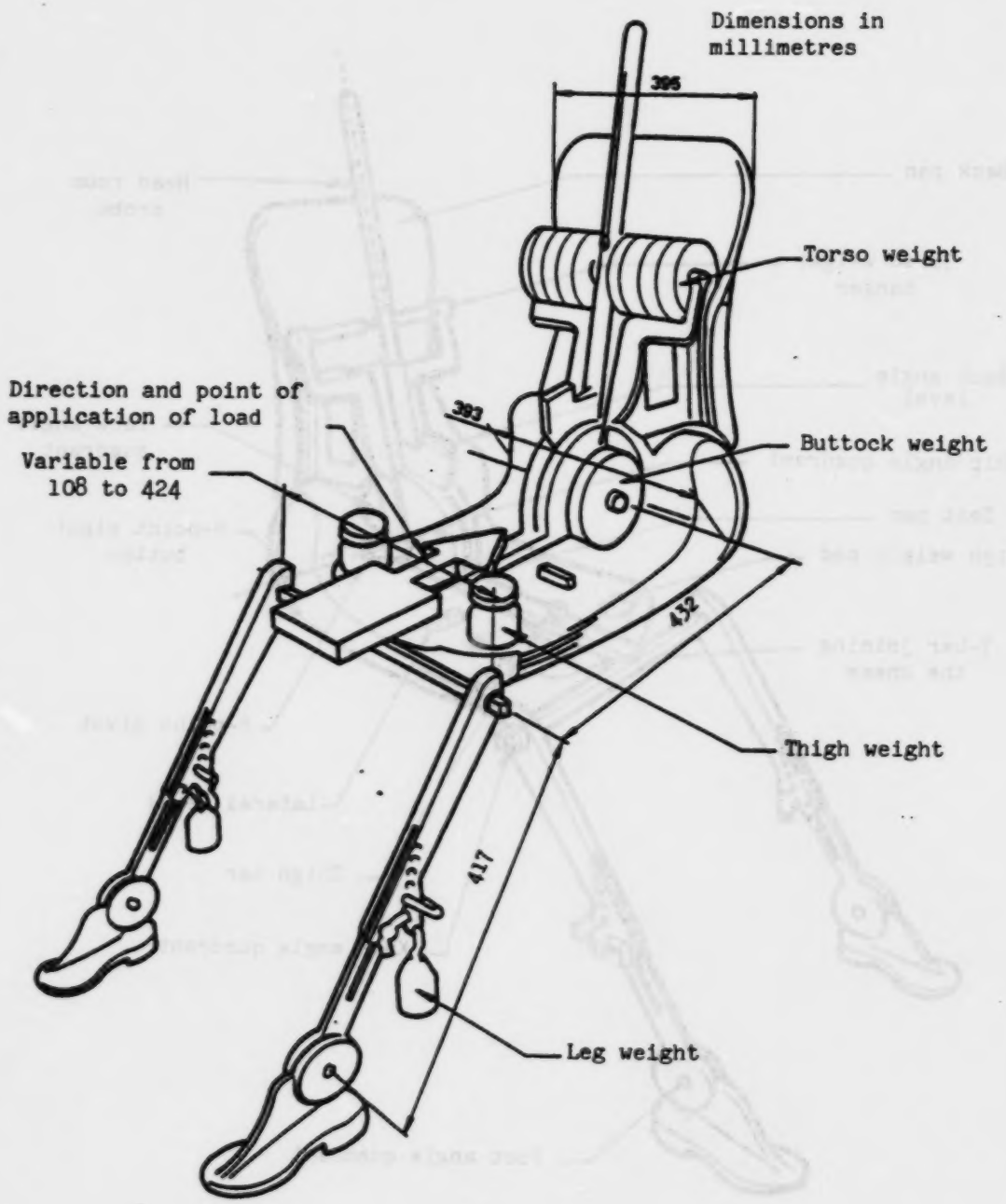

Figure 2 - Dimensions of the 3-D H machine elements and load distribution

Annex 3 - Appendix 2

THREE-DIMENSIONAL REFERENCE SYSTEM

1. The three-dimensional reference system is defined by three orthogonal planes established by the vehicle manufacturer (see figure). */

2. The vehicle measuring attitude is established by positioning the vehicle on the supporting surface such that the co-ordinates of the fiducial marks correspond to the values indicated by the manufacturer.

3. The co-ordinates of the "R" point and the "H" point are established in relation to the fiducial marks defined by the vehicle manufacturer.

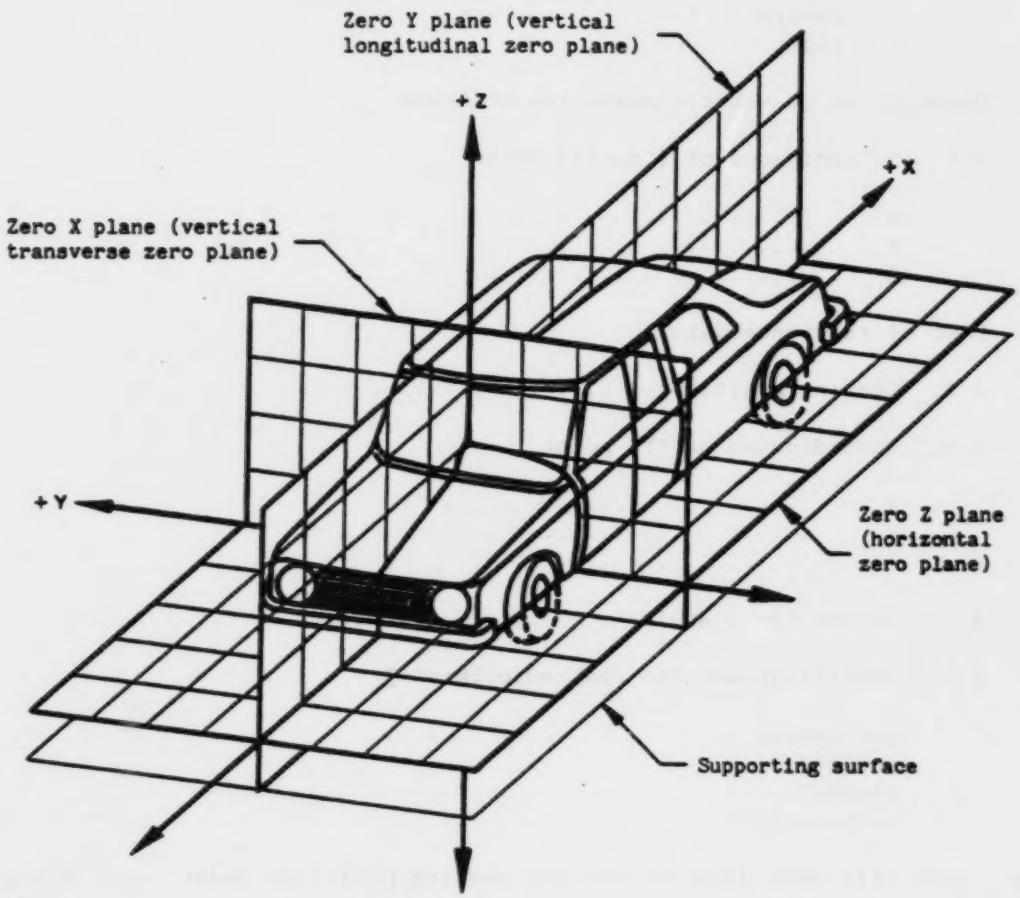

Figure - Three-dimensional reference system

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*/ The reference system corresponds to ISO standard 4130, 1978.

Annex 3 - Appendix 3

REFERENCE DATA CONCERNING SEATING POSITIONS

1. Coding of reference data

Reference data are listed consecutively for each seating position. Seating positions are identified by a two-digit code. The first digit is an Arabic numeral and designates the row of seats, counting from the front to the rear of the vehicle. The second digit is a capital letter which designates the location of the seating position in a row, as viewed in the direction of forward motion of the vehicle; the following letters shall be used:

L = left
C = centre
R = right

2. Description of vehicle measuring attitude

2.1. Co-ordinates of fiducial marks

X .....
Y .....
Z .....

3. List of reference data

3.1. Seating position: .....

3.1.1. Co-ordinates of "R" point

X .....
Y .....
Z .....

3.1.2. Design torso angle: .....

3.1.3. Specifications for seat adjustment */

horizontal : .....
vertical : .....
angular : .....
torso angle: .....

Note: List reference data for further seating positions under 3.2., 3.3., etc.

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*/ Strike out what does not apply.

Annex 4

COLLISION TEST PROCEDURE

1. INSTALLATIONS

1.1. Testing ground

The test area shall be large enough to accommodate the mobile deformable barrier propulsion system and to permit after-impact displacement of the vehicle impacted and installation of the test equipment. The part in which vehicle impact and displacement occur shall be horizontal, flat and uncontaminated, and representative of a normal, dry, uncontaminated road surface.

2. TEST CONDITIONS

2.1. The vehicle to be tested shall be stationary.

2.2. The mobile deformable barrier shall have the characteristics set out in annex 5 to this Regulation. Requirements for the examination are given in the appendix to annex 5. The mobile deformable barrier shall be equipped with a suitable device to prevent a second impact on the struck vehicle.

2.3. The trajectory of the mobile deformable barrier longitudinal median vertical plane shall be perpendicular to the longitudinal median vertical plane of the impacted vehicle.

2.4. The longitudinal vertical median plane of the mobile deformable barrier shall be coincident within ± 25 mm with a transverse vertical plane passing through the R point of the front seat adjacent to the struck side of the tested vehicle. The horizontal median plane limited by the external lateral vertical planes of the front face shall be at the moment of impact within two planes determined before the test and situated 25 mm above and below the previously defined plane.

2.5. Instrumentation shall comply with ISO 6487:1987 unless otherwise specified in this Regulation.

2.6. The stabilized temperature of the test dummy at the time of the side impact test shall be 22 ± 4°C.

3. TEST SPEED

The mobile deformable barrier speed at the moment of impact shall be 50 ± 1 km/h. This speed shall be stabilized at least 0.5 m before impact. Accuracy of measurement: 1 per cent. However, if the test was performed at a higher impact speed and the vehicle met the requirements, the test shall be considered satisfactory.

4. STATE OF THE VEHICLE

4.1. General specification

The test vehicle shall be representative of the series production, shall include all the equipment normally fitted and shall be in normal running order. Some components may be omitted or replaced by equivalent masses where this omission or substitution clearly has no effect on the results of the test.

4.2. Vehicle equipment specification

The test vehicle shall have all the optional arrangements or fittings likely to influence the results of the test.

4.3. Mass of the vehicle

4.3.1. The vehicle to be tested shall have the reference mass as defined in paragraph 2.10. of this Regulation. The mass of the vehicle shall be adjusted to ± 1 per cent of the reference mass.

4.3.2. The fuel tank shall be filled with water to a mass equal to 90 per cent of the mass of a full load of fuel as specified by the manufacturer.

4.3.3. All the other systems (brake, cooling, etc.) may be empty; in this case, the mass of the liquids shall be offset.

4.3.4. If the mass of the measuring apparatus on board of the vehicle exceeds the 25 kg allowed, it may be offset by reductions which have no noticeable effect on the results of the test.

4.3.5. The mass of the measuring apparatus shall not change each axle reference load by more than 5 per cent, each variation not exceeding 20 kg.

5. PREPARATION OF THE VEHICLE

5.1. The side windows at least on the struck side shall be closed.

5.2. The doors shall be closed, but not locked.

5.3. The transmission shall be placed in neutral and the parking brake disengaged.

5.4. The comfort adjustments of the seats, if any, shall be adjusted to the position specified by the vehicle manufacturer.

5.5. The seat containing the dummy, and its elements, if adjustable, shall be adjusted as follows:

5.5.1. The longitudinal adjustment device shall be placed with the locking device engaged in the position that is nearest to midway between the foremost and rearmost positions; if this position is between two notches, the rearmost notch shall be used.

5.5.2. The head restraint shall be adjusted such that its top surface is level with the centre of gravity of the dummy's head; if this is not possible, the head restraint shall be in the uppermost position.

5.5.3. Unless otherwise specified by the manufacturer, the seat-back shall be set such that the torso reference line of the three-dimensional H point machine is set at an angle of 25 ± 1° towards the rear.

5.5.4. All other seat adjustments shall be at the mid-point of available travel; however, height adjustment shall be at the position corresponding to the fixed seat, if the vehicle type is available with adjustable and fixed seats. If locking positions are not available at the respective mid-points of travel, the positions immediately rearward, down, or outboard of the mid-points shall be used. For rotational adjustments (tilt), rearward will be the adjustment direction which moves the head of the dummy rearwards. If the dummy protrudes outside the normal passenger volume, e.g. head into roof lining, then 1 cm clearance will be provided using: secondary adjustments, seat-back angle, or fore-aft adjustment in that order.

5.6. Unless otherwise specified by the manufacturer, the other front seats shall, if possible, be adjusted to the same position as the seat containing the dummy.

5.7. If the steering wheel is adjustable, all adjustments are positioned to their mid-travel locations.

5.8. Tyres shall be inflated to the pressure specified by the vehicle manufacturer.

5.9. The test vehicle shall be set horizontal about its roll axis and maintained by supports in that position until the side impact dummy is in place and after all preparatory work is complete.

5.10. The vehicle shall be at its normal attitude corresponding to the conditions set out in paragraph 4.3. above. Vehicles with suspension enabling their ground clearance to be adjusted shall be tested under the normal conditions of use at 50 km/h as defined by the vehicle manufacturer. This shall be assured by means of additional supports, if necessary, but such supports shall have no influence on the crash behaviour of the test vehicle during the impact.

6. SIDE IMPACT DUMMY AND ITS INSTALLATION

6.1. The side impact dummy shall comply with the specifications given in annex 6 and be installed in the front seat on the impact side according to the procedure given in annex 7 to this Regulation.

6.2. The safety-belts or other restraint systems, which are specified for the vehicle, shall be used. Belts should be of an approved type, conforming to Regulation No. 16 or to other equivalent requirements and mounted on anchorages conforming to Regulation No. 14 or to other equivalent requirements.

6.3. The safety-belt or restraint system shall be adjusted to fit the dummy in accordance with the manufacturer's instructions; if there are no manufacturer's instructions, the height adjustment shall be set at middle position; if this position is not available, the position immediately below shall be used.

7. MEASUREMENTS TO BE MADE ON THE SIDE IMPACT DUMMY

7.1. The readings of the following measuring devices are to be recorded.

7.1.1. Measurements in the head of the dummy

The resultant triaxial acceleration referring to the head centre of gravity. The head channel instrumentation shall comply with ISO 6487:1987 with:

CFC: 1000 Hz, and
CAC: 150 g

7.1.2. Measurements in the thorax of the dummy

The three thorax rib deflection channels shall comply with ISO 6487:1987

CFC: 1000 Hz
CAC: 60 mm

7.1.3. Measurements in the pelvis of the dummy

The pelvis force channel shall comply with ISO 6487:1987

CFC: 1000 Hz
CAC: 15 kN

7.1.4. Measurements in the abdomen of the dummy

The abdomen force channels shall comply with ISO 6487:1987

CFC: 1000 Hz
CAC: 5 kN

Annex 4 - Appendix 1

DETERMINATION OF PERFORMANCE DATA

The required results of the tests are specified in paragraph 5.2. of this Regulation.

1. HEAD PERFORMANCE CRITERION (HPC)

When head contact takes place, this performance criterion is calculated for the total duration between the initial contact and the last instant of the final contact.

HPC is the maximum value of the expression:

$$(t_2 - t_1)\left(\frac{1}{t_2 - t_1}\int_{t_1}^{t_2} a\,dt\right)^{2.5}$$

where a is the resultant acceleration at the centre of gravity of the head in metres per second square divided by 9.81 recorded versus time and filtered at channel frequency class 1000 Hz; t_1 and t_2 are any two times between the initial contact and the last instant of the final contact.

2. THORAX PERFORMANCE CRITERIA

2.1. Chest deflection: the peak chest deflection is the maximum value of deflection on any rib as determined by the thorax displacement transducers, filtered at channel frequency class 180 Hz.

2.2. Viscous criterion: the peak viscous response is the maximum value of VC on any rib which is calculated from the instantaneous product of the relative thorax compression related to the half thorax and the velocity of compression derived by differentiation of the compression, filtered at channel frequency class 180 Hz. For the purposes of this calculation the standard width of the half thorax rib cage is 140 mm.

$$VC = \max\left[\frac{D}{0.14} \cdot \frac{dD}{dt}\right]$$

where D (metres) = rib deflection

The calculation algorithm to be used is set out in annex 4, appendix 2.

3. ABDOMEN PROTECTION CRITERION

The peak abdominal force is the maximum value of the sum of the three forces measured by transducers mounted 39 mm below the surface on the crash side, CFC 600 Hz.

4. PELVIS PERFORMANCE CRITERION

The pubic symphisis peak force (PSPF) is the maximum force measured by a load cell at the pubic symphysis of the pelvis, filtered at channel frequency class 600 Hz.

Annex 4 - Appendix 2

THE PROCEDURE FOR CALCULATING THE VISCOUS CRITERION FOR EUROSID 1

The Viscous Criterion, VC, is calculated as the instantaneous product of the compression and the rate of deflection of the rib. Both are derived from the measurement of rib deflection. The rib deflection response is filtered once at Channel Frequency Class 180. The compression at time (t) is calculated as the deflection from this filtered signal expressed as the proportion of the half width of the EUROSID 1 chest, measured at the metal ribs (0.14 metres):

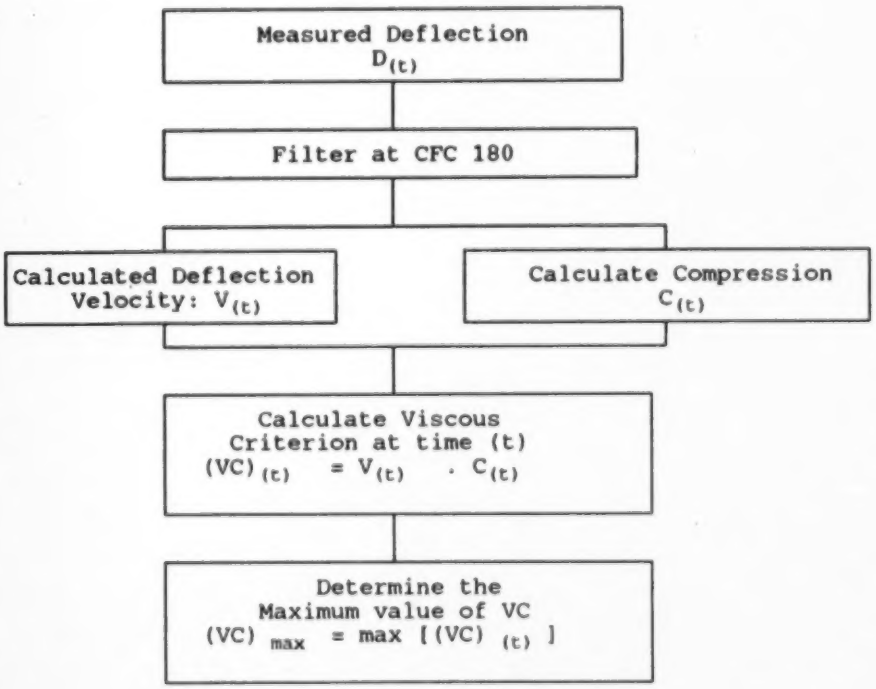
$$C_{(t)} = \frac{D_{(t)}}{0.14}$$

The rib deflection velocity at time (t) is calculated from the filtered deflection as:

$$V_{(t)} = \frac{8\,[D_{(t+1)} - D_{(t-1)}] - [D_{(t+2)} - D_{(t-2)}]}{12\partial t}$$

where $D_{(t)}$ is the deflection at time (t) in metres and ∂t is the time interval in seconds between the measurements of deflection. The maximum value of ∂t shall be 125.10^{-6} seconds.

This calculation procedure is shown diagrammatically below:



Annex 5

MOBILE DEFORMABLE BARRIER CHARACTERISTICS

1. CHARACTERISTICS OF THE BARRIER

1.1. The total mass shall be 950 ± 20 kg.

1.2. The front and rear track width of the trolley shall be 1,500 ± 10 mm.

1.3. The wheel base of the trolley shall be 3,000 ± 10 mm.

1.4. The centre of gravity shall be situated in the longitudinal median vertical plane within 10 mm, 1,000 ± 30 mm behind the front axle and 500 ± 30 mm above the ground.

1.5. The distance between the front face of the impactor and the centre of gravity of the barrier shall be 2,000 ± 30 mm.

2. CHARACTERISTICS OF THE IMPACTOR

2.1. Geometrical characteristics

2.1.1. The impactor consists of six independent joined parts whose forms, sizes and positioning are shown in figure 1.

2.1.2. The deformable impact zone shall be 1,500 ± 10 mm wide and 500 ± 5 mm high.

2.1.3. The ground clearance shall be 260 ± 5 mm measured in static condition before impact.

2.1.4. There shall be six deformable elements, divided into two rows of three elements. All the elements shall have the same width (500 ± 5 mm) and the same height (250 ± 3 mm); the elements of the upper row shall be 440 ± 5 mm deep and those of the lower row 500 ± 5 mm deep.

2.2. Material characteristics

The material of the impactor must be an aluminium honeycomb. Other materials can be used if equal results as described in paragraph 2.3. have been proved to the satisfaction of the Technical Service. In any case the type of impactor must be indicated in the test report.

2.3. Deformation characteristics

2.3.1. Deviation from the limits of the force-deflection corridors characterizing the rigidity of the impactor - as defined in this annex, figure 2 - may be allowed provided that:

2.3.1.1. the deviation occurs after the beginning of the impact and before the deformation of the impactor is equal to 150 mm;

2.3.1.2. the deviation does not exceed 50 per cent of the nearest instantaneous prescribed limit of the corridor;

2.3.1.3. each displacement corresponding to each deviation does not exceed 35 mm of the deflection, and the sum of these displacements does not exceed 70 mm (see figure 2) and

2.3.1.4. the sum of the energy derived from deviating outside the corridor does not exceed 5 per cent of the gross energy for that block.

2.3.2. Parts 1 and 3 are identical. Their rigidity is such that their force-deflection curves fall within the hatched area of figure 2, graph 2a.

2.3.3. Parts 5 and 6 are identical. Their rigidity is such that their force-deflection curves fall within the hatched area of figure 2, graph 2d.

2.3.4. The rigidity of part 2 is such that its force-deflection curve falls within the hatched area of figure 2, graph 2b.

2.3.5. The rigidity of part 4 is such that its force-deflection curve falls within the hatched area of figure 2, graph 2c.

2.3.6. The force-deflection of the impactor as a whole shall fall within the hatched area of figure 2, graph 2e.

2.3.7. The force-deflection curves shall be verified by a test detailed in annex 5 - appendix, consisting of an impact of the assembly against a dynamometric barrier at 35 ± 2 km/h.

2.3.8. The dissipated energy 1/ against parts 1 and 3 during the test shall be equal to 10 ± 2 kJ for each of these parts.

2.3.9. The dissipated energy against parts 5 and 6 shall be equal to 3.5 ± 1 kJ for each of these parts.

1/ The amounts of energy indicated are the amounts of energy dissipated by the system when the extent to which the impactor is crushed is greatest.

2.3.10. The dissipated energy against part 4 shall be equal to 4 ± 1 kJ.

2.3.11. The dissipated energy against part 2 shall be equal to 14 ± 2 kJ.

2.3.12. The total dissipated energy during the impact shall be equal to 45 ± 5 kJ.

2.3.13. Impactor deformation measured after the test at level B (figure 1) shall be equal to 330 ± 20 mm.

Figure 1

Design of the mobile deformable barrier impactor

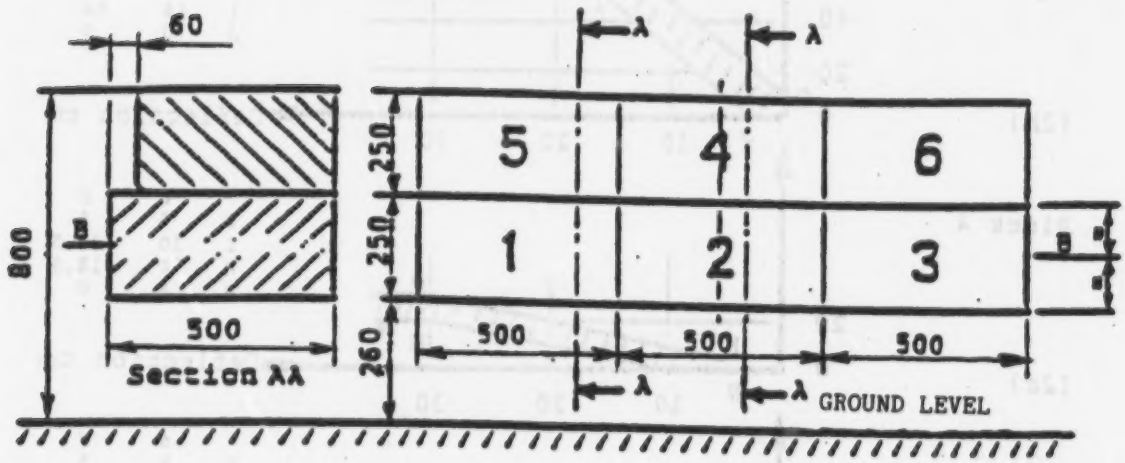
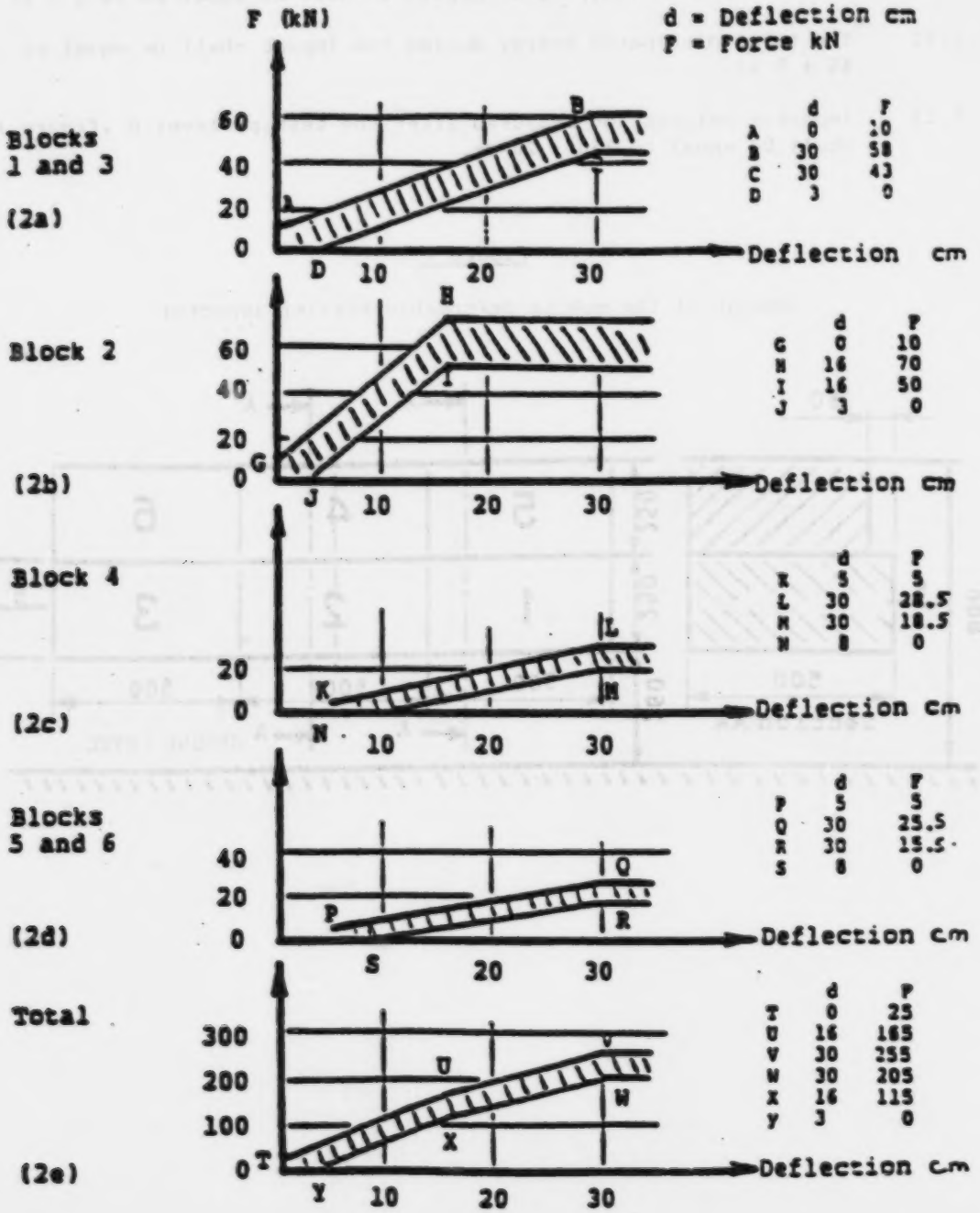


Figure 2

Force-deflection curves



Note: During the verification test, the loads measured on parts 1 and 3 and on parts 5 and 6 respectively shall not differ by more than 10 per cent for a given deflection.

Annex 5 - Appendix

EXAMINATION OF THE MOBILE DEFORMABLE BARRIER

1. SCOPE

This appendix contains a prescription for the examination of the mobile deformable barrier. The test authority is responsible for the mobile deformable barrier meeting the specifications using a test against a dynamometric wall supported by a fixed rigid barrier.

2. INSTALLATION

2.1. Testing ground

The test area shall be large enough to accommodate the run-up track of the mobile deformable barrier, the rigid barrier and the technical equipment necessary for the test. The last part of the track, for at least 5 m before the rigid barrier, shall be horizontal, flat and smooth.

2.2. Fixed rigid barrier and dynamometric wall

2.2.1. The rigid barrier shall consist of a block of reinforced concrete not less than 3 m wide in front and not less than 1.5 m high. The thickness of the rigid barrier shall be such that it weighs at least 70 tonnes. The front face shall be vertical, perpendicular to the axis of the run-up track and covered with load cells capable of measuring the total load on each part of the mobile deformable barrier impactor at the moment of impact. The impact plate area centres shall align with those of the chosen mobile deformable barrier; their edges shall clear adjacent areas by 20 mm. Cell mounting and plate surfaces shall be in accordance with the requirements set out in the annex to ISO 6487:1987. In cases where surface protection is added, it shall not degrade the transducer responses.

2.2.2. The rigid barrier shall be either anchored in the ground or placed on the ground with, if necessary, additional arresting devices to limit its displacement. A rigid barrier with load cells having different characteristics but giving results that are at least equally conclusive may be used.

3. PROPULSION OF THE MOBILE DEFORMABLE BARRIER

At the moment of impact the mobile deformable barrier shall no longer be subject to the action of any additional steering or propelling device. It shall reach the obstacle on a course perpendicular to the collision barrier. Impact alignment shall be accurate to within 10 mm.

4. MEASURING INSTRUMENTS

4.1. Speed

The impact speed shall be 35 +2 -2 km/h. The instrument used to record the speed on impact shall be accurate to within one per cent.

4.2. Loads

Measuring instruments shall meet the specifications set forth in ISO 6487:1987

CFC for all blocks = 60 Hz
CAC for blocks 1 and 3 = 120 kN
CAC for blocks 4, 5 and 6 = 60 kN
CAC for block 2 = 140 kN

4.3. Acceleration

The acceleration in the longitudinal direction shall be measured at a place not subject to bending. The instrumentation shall comply with ISO 6487:1987 with the following specifications:

CFC 1000 Hz (before integration)
CFC 60 Hz (after integration)
CAC 50 g

5. GENERAL SPECIFICATION OF BARRIER

5.1. The individual characteristics of each barrier shall comply with paragraph 1 of annex 5 and shall be recorded.

6. GENERAL SPECIFICATION OF THE IMPACTOR TYPE

6.1. The suitability of an impactor type shall be confirmed when the outputs from the six load cells each produce signals complying with the requirements indicated in annex 5, paragraph 2.2. to this Regulation when recorded.

6.2. Impactors shall carry consecutive serial numbers including the date of manufacture.

Annex 6

TECHNICAL DESCRIPTION OF THE SIDE IMPACT DUMMY

1. GENERAL

1.1. The dimensions and masses of the side impact dummy represent a 50th percentile adult male, without lower arms.

1.2. The side impact dummy consists of a metal and plastic skeleton covered by flesh-simulating rubber, plastic and foam.

1.3. The side impact dummy prescribed in this Regulation, including the instrumentation and calibration, is described in technical drawings and a user's manual. 1/

2. CONSTRUCTION

2.1. For an overview of the side impact dummy see figure 1 and table 1 of this annex.

2.2. Head

2.2.1. The head is shown as part No. 1 in figure 1 of this annex.

2.2.2. The head consists of an aluminium shell covered by a pliable vinyl skin. The interior of the shell is a cavity accommodating triaxial accelerometers and ballast.

2.3. Neck

2.3.1. The neck is shown as part No. 2 in figure 1 of this annex.

2.3.2. The neck consists of a head/neck interface piece, a neck/thorax interface piece and a central section that links the two interfaces to one another.

2.3.3. The head/neck interface piece (part No. 2a) and the neck/thorax interface piece (part No. 2c) both consist of two aluminium disks linked together by means of a half spherical screw and eight rubber buffers.

2.3.4. The cylindrical central section (part No. 2b) is made of rubber.

1/ Until the publication of appropriate ISO Standards these documents (EUROSID-1 User's Manual: Delft, November 1990) can be obtained from TNO Road Vehicles Research Institute, P.O. Box 6033, 2600 JA Delft, Schoemakerstraat 97, 2628 VK Delft, The Netherlands.

2.3.5. The neck is mounted on the neck-bracket, shown as part No. 3 in figure 1 of this annex.

2.3.6. The angle between the two faces of the neck-bracket is 25 degrees. Because the shoulder block is inclined 5 degrees backwards, the resulting angle between the neck and torso is 20 degrees.

2.4. Shoulder

2.4.1. The shoulder is shown as part No. 4 in figure 1 of this annex.

2.4.2. The shoulder consists of a shoulder block, two clavicles and a shoulder cap.

2.4.3. The shoulder block (part No. 4a) consists of an aluminium spacer block, an aluminium plate on top and an aluminium plate on the bottom of the spacer block.

2.4.4. The clavicles (part No. 4b) are made of polypropylene. The clavicles are held back in their neutral position by two elastic cords (part No. 4c) which are clamped to the rear of the shoulder block. The outer edge of both clavicles accommodates a design allowing for standard arm positions.

2.4.5. The shoulder cap (part No. 4d) is made of low-density polyurethane foam and is attached to the shoulder block.

2.5. Thorax

2.5.1. The thorax is shown as part No. 5 in figure 1 of this annex.

2.5.2. The thorax consists of a rigid thoracic spine box and three identical rib modules.

2.5.3. The thoracic spine box (part No. 5a) is made of steel. On the rear surface a lead-filled plastic back plate is mounted (part No. 5b).

2.5.4. The top surface of the thoracic spine box is inclined 5 degrees backwards.

2.5.5. A rib module (part No. 5c) consists of a steel rib covered by a flesh-simulating polyurethane foam (part No. 5d), a piston-cylinder assembly (part No. 5e) linking the rib and spine box together, a hydraulic damper (part No. 5f) and a stiff damper spring (part No. 5g).

2.5.6. In the piston-cylinder assembly is a tuning spring (part No. 5h).

2.5.7. A displacement transducer (part No. 5i) can be mounted on the front face of the cylinder and connected to the inside of the rib.

2.6. Arms

2.6.1. The arms are shown as part No. 6 in figure 1 of this annex.

2.6.2. The arms have a plastic skeleton covered by a polyurethane "flesh" and a PVC skin.

2.6.3. The shoulder/arm joint allows for discrete arm positions at 0°, 40° and 90° to the torso line.

2.6.4. The shoulder/arm joint allows for a flexion/extension rotation only.

2.7. Lumbar spine

2.7.1. The lumbar spine is shown as part No. 7 in figure 1 of this annex.

2.7.2. The lumbar spine consists of a solid rubber cylinder with two steel interface plates at each end, and a steel cable inside the cylinder.

2.8. Abdomen

2.8.1. The abdomen is shown as part No. 8 in figure 1 of this annex.

2.8.2. The abdomen consists of a metal casting and a polyurethane foam covering.

2.8.3. The central part of the abdomen is a metal casting (part No. 8A). A cover plate is mounted on top of the casting.

2.8.4. The covering (part No. 8b) is made of polyurethane foam. A curved slab of rubber filled with lead-pellets is integrated in the foam covering at both sides.

2.8.5. Between the foam covering and the rigid casting at each side of the abdomen, either three force transducers (part No. 8c) or three non-measuring "dummy" units can be mounted.

2.9. Pelvis

2.9.1. The pelvis is shown as part No. 9 in figure 1 of this annex.

2.9.2. The pelvis consists of a sacrum block, two iliac wings, two hip joints and a foam covering.

2.9.3. The sacrum (part No. 9a) consists of a lead-filled aluminium block and an aluminium plate mounted on top of this block.

2.9.4. The iliac wings (part No. 9b) are made of polyurethane.

2.9.5. The hip joints (part No. 9c) are made of steel. They consist of an upper femur part and a ball joint connected to an axle passing through the dummy's H-point.

2.9.6. The flesh system (part No. 9d) is made of a PVC skin filled with polyurethane foam. At the H-point location the skin is replaced by a large open-cell polyurethane foam cylinder (part No. 9e), attached to a steel plate fixed on the iliac wing by an axle going through the ball joint.

2.9.7. The iliac wings are linked together at the pubic symphysis by a force transducer (part No. 9f) or a "dummy" transducer.

2.10. Legs

2.10.1. The legs are shown as part No. 10 in figure 1 of this annex.

2.10.2. The legs consist of a metal skeleton covered by a flesh-stimulating polyurethane foam and a plastic skin.

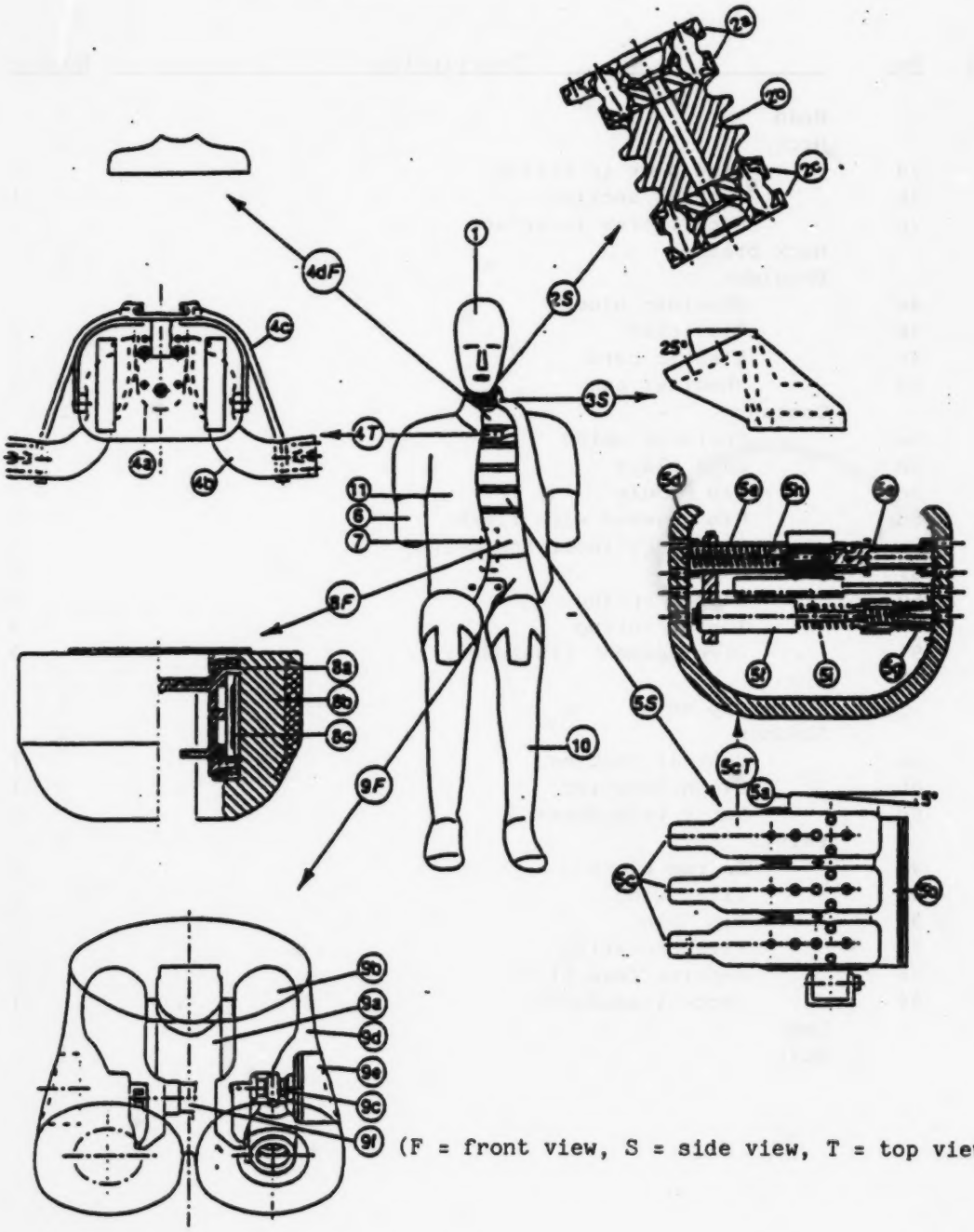
2.10.3. The knee and ankle joint allow for a flexion/extension rotation only.

2.11. Suit

2.11.1. The suit is shown as part No. 11 in figure 1 of this annex.

2.11.2. The suit is made of rubber and covers the shoulders, thorax, upper part of the arms, the abdomen and lumbar spine, the upper part of the pelvis.

Figure 1. CONSTRUCTION OF SIDE IMPACT DUMMY



(F = front view, S = side view, T = top view)

Table 1 - Side Impact Dummy Components

Part	No.	Description	Number
1		Head	1
2		Neck	1
	2a	Head/neck interface	1
	2b	Central section	1
	2c	Neck/thorax interface	1
3		Neck-bracket	1
4		Shoulder	1
	4a	Shoulder block	1
	4b	Clavicles	2
	4c	Elastic cord	2
	4d	Shoulder cap	1
5		Thorax	1
	5a	Thoracic spine	1
	5b	Back plate	1
	5c	Rib module	3
	5d	Rib covered with flesh	3
	5e	Piston-cylinder assembly	3
	5f	Damper	3
	5g	Damper spring	3
	5h	Tuning spring	3
	5i	Displacement transducer	3
6		Arm	2
7		Lumbar spine	1
8		Abdomen	1
	8a	Central casting	1
	8b	Flesh covering	1
	8c	Force transducer	3
9		Pelvis	1
	9a	Sacrum block	1
	9b	Iliac wing	2
	9c	Hip joint	2
	9d	Flesh covering	1
	9e	H-point foam block	2
	9f	Force transducer	1
10		Leg	2
11		Suit	1

3. ASSEMBLY OF THE DUMMY

3.1. Head-neck

3.1.1. The required torque on the half spherical screws for assembly of the neck is 10 Nm.

3.1.2. The head is mounted to the head-neck interface plate of the neck by three screws.

3.1.3. The neck-thorax interface plate of the neck is mounted to the neck-bracket by four screws.

3.2. Neck-shoulder-thorax

3.2.1. The neck-bracket is mounted to the shoulder block by four screws.

3.2.2. The shoulder-block is mounted to the top-surface of the thoracic spine box by three screws.

3.3. Shoulder-arm

3.3.1. The arms may be mounted to the shoulder clavicles and adjusted by means of a screw and a bearing. The required torque to hold the arm in the defined standard position is 0.6 Nm.

3.4. Thorax-lumbar spine-abdomen

3.4.1. A lumbar spine adaptor is mounted by two screws to the lower part of the thoracic spine.

3.4.2. The lumbar spine adaptor is mounted to the top of the lumbar spine by two screws.

3.4.3. The top flange of the central abdominal casting is clamped between the lumbar spine adaptor and the lumbar spine.

3.5. Lumbar spine-pelvis-legs

3.5.1. The lumbar spine is mounted to the lumbar spine bottom plate by three screws.

3.5.2. The lumbar spine bottom plate is mounted to the sacrum block of the pelvis by three screws.

3.5.3. The legs are mounted to the upper femur - hip joint of the pelvis by a screw.

3.5.4. The legs may be assembled and adjusted by means of hinge joints in the knees and ankles.

4. MAIN CHARACTERISTICS

4.1. Mass

4.1.2. The masses of the main dummy components are presented in table 2 of this annex.

Table 2 - Dummy Component Masses

Component	Mass (kg)	Principal Contents
Head	4.0 ± 0.4	Complete head including triaxial accelerometer
Neck	1.0 ± 0.1	Neck, not including neck-bracket
Thorax	22.4 ± 1.5	Neck bracket, shoulders, arm attachment bolts, spine box, spine back plate, rib modules, rib deflection transducers, lumbar spine adaptor, shoulder cap, abdomen central casting, abdomen force transducers, 2/3 of suit.
Arm	1.3 ± 0.1	Upper arm, including arm positioning plate (each)
Abdomen	5.0 ± 0.5	Abdomen flesh covering and lumbar spine
Pelvis	12.0 ± 1.0	Sacrum block, lumbar spine bottom plate, hip ball joints, upper femurs, iliac wings, pubic force transducer, pelvis flesh covering, 1/3 of suit.
Leg	12.5 ± 1.0	Foot, lower and upper leg and flesh as far as junction with upper femur (each).
Total	72.0 ± 0.5	

4.2. Principal dimensions

4.2.1. The principal dimensions of the side impact dummy (including the suit), based on figure 2 of this annex, are given in table 3 of this annex.

Figure 2 - Measurements for principal dummy dimensions
(see table 3)

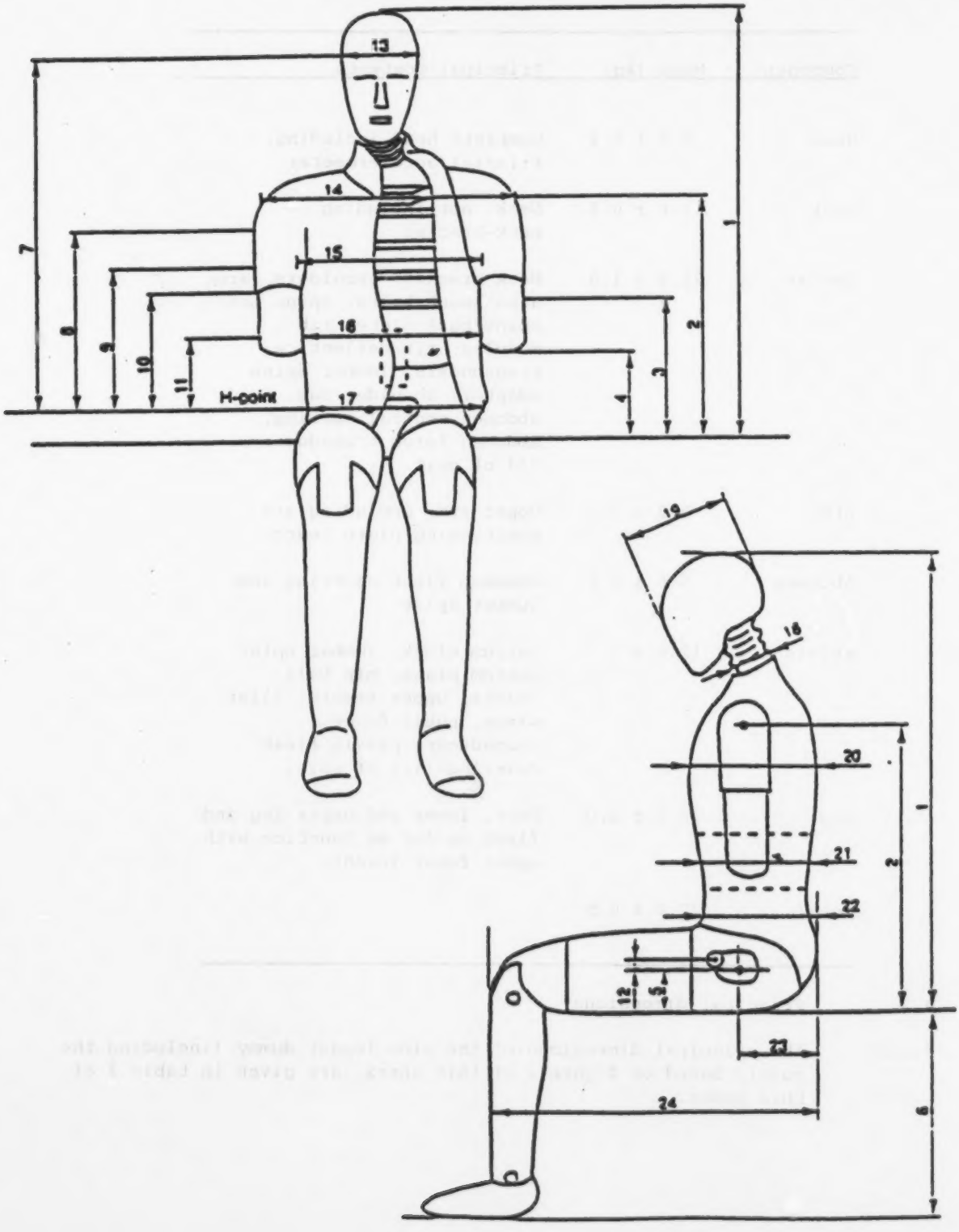


Table 3 - Principal Dummy Dimensions

No.	Parameter	Dimension (mm)
1	Sitting height	904 ± 7
2	Seat to shoulder joint	557 ± 5
3	Seat to bottom lower rib	357 ± 5
4	Seat to arm	242 ± 5
5	Seat to H-point	98 ± 2
6	Sole to seat, sitting	456 ± 5
7	H-point to head c.o.g.	687 ± 5
8	H-point to centre upper rib	393 ± 3
9	H-point to centre middle rib	337 ± 3
10	H-point to centre lower rib	281 ± 3
11	H-point to centre abdominal force transducer	180 ± 3
12	H-point to centre pubic symphysis force transducer	14 ± 2
13	Head width	154 ± 2
14	Shoulder/arm width	482 ± 5
15	Thorax width	330 ± 5
16	Abdomen width	290 ± 5
17	Pelvis width	355 ± 5
18	Neck diameter	80 ± 2
19	Head depth	201 ± 5
20	Thorax depth	276 ± 5
21	Abdomen depth	204 ± 5
22	Pelvis depth	245 ± 5
23	Back of buttocks to H-point	157 ± 2
24	Back of buttocks to front knee	610 ± 5

5. CERTIFICATION OF THE DUMMY

5.1. Impact side

5.1.1. Depending on the vehicle side to be impacted, dummy parts should be certified on the left hand side or right hand side.

5.1.2. The configurations of the rib modules (including instrumentation), the abdominal force transducers and the pubic symphysis transducer have to be converted to the required impact side.

5.2. Instrumentation

All instrumentation shall be calibrated in compliance with the requirements of the documentation specified in paragraph 1.3.

5.2.1. All instrumentation channels shall comply with ISO 6487 : 1987.

5.3. Visual check

5.3.1. All dummy parts should be visually checked for damage and if necessary be replaced before the certification test.

5.4. General test set-up

5.4.1. Figure 3 of this annex shows the test set-up for all certification tests on the side impact dummy.

5.4.2. The tests on the head, neck, thorax and lumbar spine are carried out on disassembled parts of the dummy.

5.4.3. The tests on the shoulder, abdomen and pelvis are performed with the complete dummy (without suit). In these tests the dummy is seated on a flat surface with two sheets of less than or equal to 2 mm thick Teflon, placed between the dummy and the surface.

5.4.4. All parts to be certified should be kept in the test room for a period of at least four hours at a temperature between 18°C and 22°C prior to a test.

5.4.5. The time between two repeated certification tests should be at least 30 minutes.

5.5. Head

5.5.1. The head is dropped from 200 ± 1 mm onto a flat, rigid impact surface.

5.5.2. The angle between the impact surface and the midsagittal plane of the head is 35° ± 1° allowing an impact of the upper-side of the head.

5.5.3. The peak resultant head acceleration, filtered using CFC 1000, should be between 100 g and 150 g.

5.5.4. The head performance can be adjusted to meet the requirement by altering the friction characteristics of the flesh-skull interface (e.g. by lubrication with talcum powder or PTFE spray).

5.6. Neck

5.6.1. The head-neck interface of the neck is mounted to a special symmetrical certification headform with a mass of 3.9 ± 0.05 kg (see figure 4).

5.6.2. The headform and neck are mounted upside-down to the bottom of a neck-bending pendulum allowing a lateral motion of the system.

5.6.3. The neck-pendulum is equipped with a uniaxial accelerometer mounted at 1,655 ± 5 mm from the pendulum pivot.

5.6.4. The neck-pendulum should be allowed to fall freely from a height chosen to achieve an impact velocity of 3.4 ± 0.1 m/s measured at the accelerometer location.

5.6.5. The neck-pendulum is decelerated from impact velocity to zero by an appropriate device, resulting in a deceleration-time history inside the corridor specified in figure 5 of this annex. All channels have to be recorded using ISO CFC 1000 filters and filtered digitally using CFC 60.

5.6.6. The maximum headform flexion angle relative to the pendulum should be 51 ± 5 degrees and should occur between 50 and 62 ms.

5.6.7. The maximum headform centre of gravity displacements in the lateral and vertical direction should be 97 ± 10 mm and 26 ± 6 mm respectively.

5.6.8. The neck performance can be adjusted by replacing the circular section buffers with buffers of a different shore hardness.

5.7. Shoulder

5.7.1. The length of the elastic cord should be adjusted so that a force between 27.5 N and 32.5 N applied in a forward direction 4 ± 1 mm from the outer edge of the clavicle in the same plane as the clavicle movement, is required to move the clavicle forward.

5.7.2. The dummy is seated on a flat, horizontal, rigid surface with no back support. The thorax is positioned vertically and the arms should be set at an angle of 40° ± 2° forward to the vertical. The legs are positioned horizontally.

5.7.3. The impactor is a pendulum of 23.5 + 0.0/-0.2 kg and 152 ± 2 mm diameter. The impactor is suspended from a rigid support by four wires with the centre line of the impactor at least 3.5 m below the rigid support.

5.7.4. The impactor is equipped with an accelerometer sensitive in the direction of impact and located on the impactor axis.

5.7.5. The impactor should freely swing onto the shoulder of the dummy with an impact velocity of 4.3 ± 0.1 m/s.

5.7.6. The impact direction is perpendicular to the anterior-posterior axis of the dummy and the axis of the impactor coincides with the axis of the upper arm pivot.

5.7.7. The peak acceleration of the impactor, filtered using CFC 180, should be between 7.5 and 10.5 g.

5.8. Arms

5.8.1. No dynamic certification procedure is defined for the arms.

5.9. Thorax

5.9.1. Each rib module is certified separately.

5.9.2. The rib module is positioned vertically in a drop test rig and the rib cylinder is clamped rigidly onto the rig.

5.9.3. The impactor is a free fall mass of 7.8 + 0.0/-0.1 kg with a flat face and a diameter of 150 ± 2 mm.

5.9.4. The centre line of the impactor should be aligned with the centre line of the rib's piston.

5.9.5. The impact velocity is 1.0, 2.0, 3.0 and 4.0 m/s respectively. Impact velocities should not vary from those specified by more than 2 per cent.

5.9.6. The rib displacement should be measured, for instance using the rib's own displacement transducer.

5.9.7. The rib certification requirements are shown in table 4 of this annex.

5.9.8. The performance of the rib module can be adjusted by replacing the tuning spring inside the cylinder with one of a different stiffness.

Table 4 - Certification requirements for the full rib module

Impact velocity (m/s)	Displacement (mm)	
	Minimum	Maximum
1.0	10.0	14.0
2.0	23.5	27.5
3.0	36.0	40.0
4.0	46.0	51.0

5.10. Lumbar spine

5.10.1. The lumbar spine is mounted to the special symmetrical certification headform with a mass of 3.9 ± 0.05 kg (see figure 4).

5.10.2. The headform and lumbar spine are mounted upside-down to the bottom of a neck-bending pendulum allowing a lateral motion of the system.

5.10.3. The neck-pendulum is equipped with a uniaxial accelerometer mounted at 1,655 ± 5 mm from the pendulum pivot.

5.10.4. The neck-pendulum should be allowed to fall freely from a height chosen to achieve an impact velocity of 6.05 ± 0.1 m/s measured at the accelerometer location.

5.10.5. The neck-pendulum is decelerated from impact velocity to zero by an appropriate device, resulting in a deceleration-time history inside the corridor specified in figure 6 of this annex. All channels have to be recorded using ISO 6487 CFC 1000 filters and filtered digitally using CFC 60.

5.10.6. The maximum headform flexion angle relative to the pendulum should be 50 ± 5 degrees and should occur between 39 and 53 ms.

5.10.7. The maximum headform centre of gravity displacements in the lateral and vertical direction should be 104 ± 7 mm and 33 ± 7 mm respectively.

5.10.8. The performance of the lumbar spine can be adjusted by changing the length of the spine.

5.11. Abdomen

5.11.1. The dummy is seated on a flat, horizontal, rigid surface with no back support. The thorax is positioned vertically, while the arms and legs are positioned horizontally.

5.11.2. The impactor is a pendulum of 23.5 + 0.0/-0.2 kg and 152 ± 2 mm diameter.

5.11.3. The pendulum is equipped with a horizontal "arm rest" impactor face of 1.0 ± 0.01 kg. The total mass of the impactor with the arm rest face is 24.5 + 0.0/-0.2 kg. The rigid arm rest is 70 ± 1 mm high, 150 ± 1 mm wide and should be allowed to penetrate at least 60 mm into the abdomen. The centreline of the pendulum coincides with the centre of the arm rest.

5.11.4. The impactor is equipped with an accelerometer sensitive in the direction of impact and located on the impactor axis.

5.11.5. The impactor should freely swing onto the abdomen of the dummy with an impact velocity of 6.3 ± 0.1 m/s.

5.11.6. The impact direction is perpendicular to the anterior-posterior axis of the dummy and the axis of the impactor is aligned with the centre of the middle force transducer.

5.11.7. The peak force of the impactor, obtained from the impactor acceleration filtered using CFC 180 and multiplied by the impactor/armrest mass, should be between 9.5 and 11.1 kN, and occur between 9.8 and 11.4 ms.

5.11.8. The force-time histories measured by the three abdominal force transducers must be summed and filtered using CFC 600. The peak force of this sum should be between 5.9 and 7.9 kN.

5.12. Pelvis

5.12.1. The dummy is seated on a flat, horizontal, rigid surface with no back support. The thorax is positioned vertically while the arms and legs are positioned horizontally.

5.12.2. The impactor is a pendulum of 23.5 + 0.0/-0.2 kg and 152 ± 2 mm diameter.

5.12.3. The impactor is equipped with an accelerometer sensitive in the direction of impact and located on the impactor axis.

5.12.4. The impactor should freely swing onto the pelvis of the dummy with an impact velocity of 4.3 ± 0.1 m/s.

5.12.5. The impact direction is perpendicular to the anterior-posterior axis of the dummy and the axis of the impactor is aligned with the centre of the H-point foam cylinder.

5.12.6. The peak force of the impactor, obtained from the impactor acceleration filtered using CFC 180 and multiplied by the impactor mass, should be between 4.4 and 5.4 kN, and occur between 10.3 and 15.5 ms.

5.12.7. The pubic symphisis force, filtered using CFC 600, should be between 1.04 and 1.64 kN and occur between 9.9 and 15.9 ms.

5.13. Legs

5.13.1. No dynamic certification procedure is defined for the legs.

Figure 3 - OVERVIEW OF THE SIDE IMPACT DUMMY CERTIFICATION TEST SET-UP

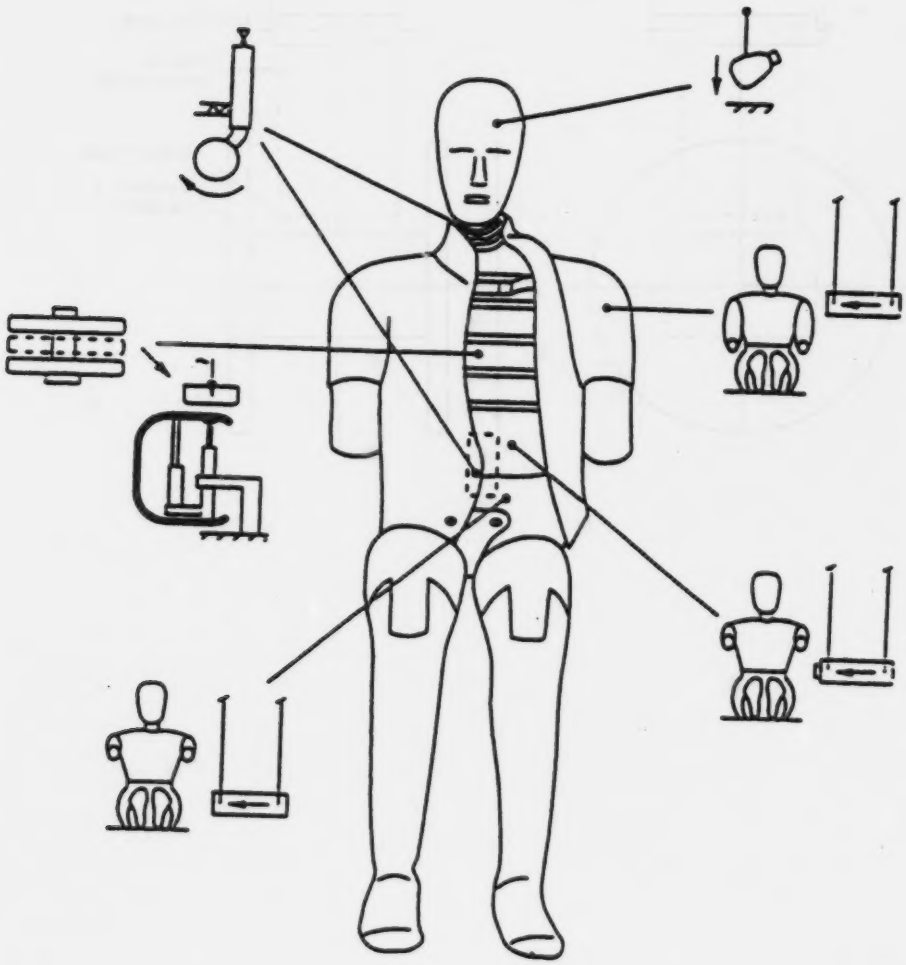


Figure 4 - NECK AND LUMBAR SPINE CERTIFICATION TEST SET-UP

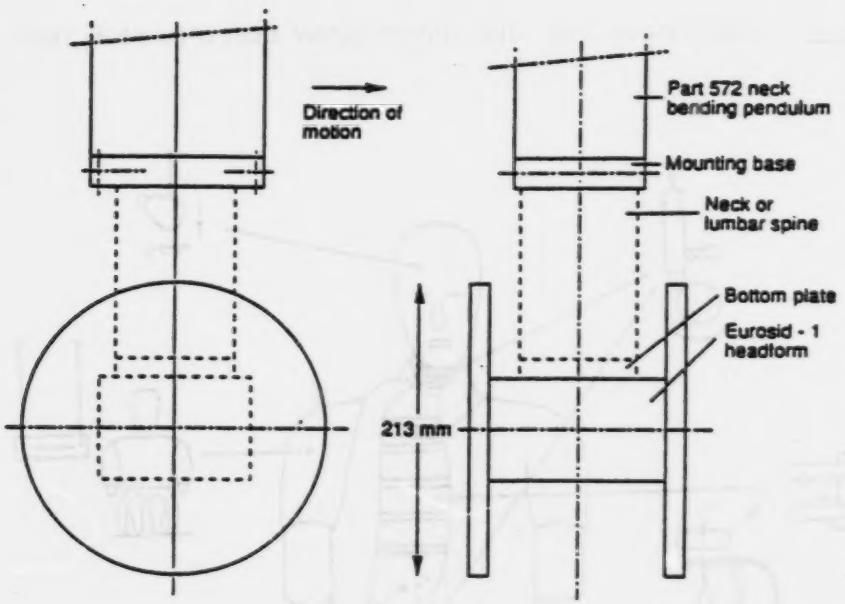


Figure 5 - PENDULUM DECELERATION-TIME CORRIDOR FOR NECK CERTIFICATION TEST

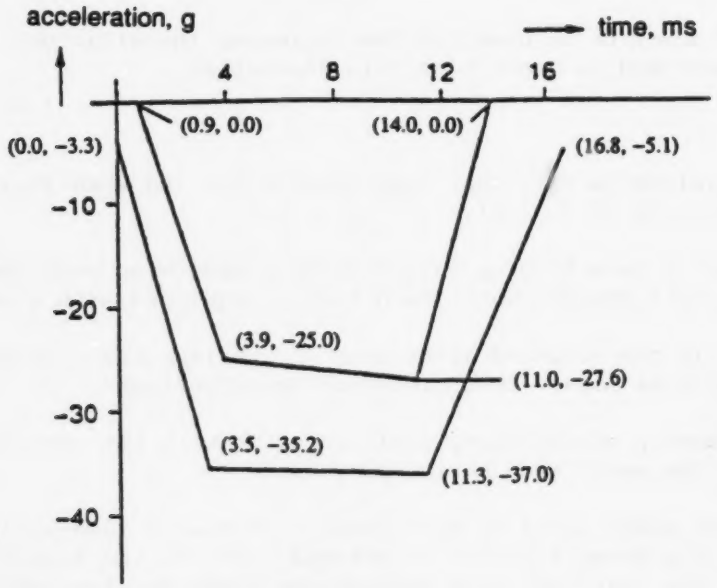
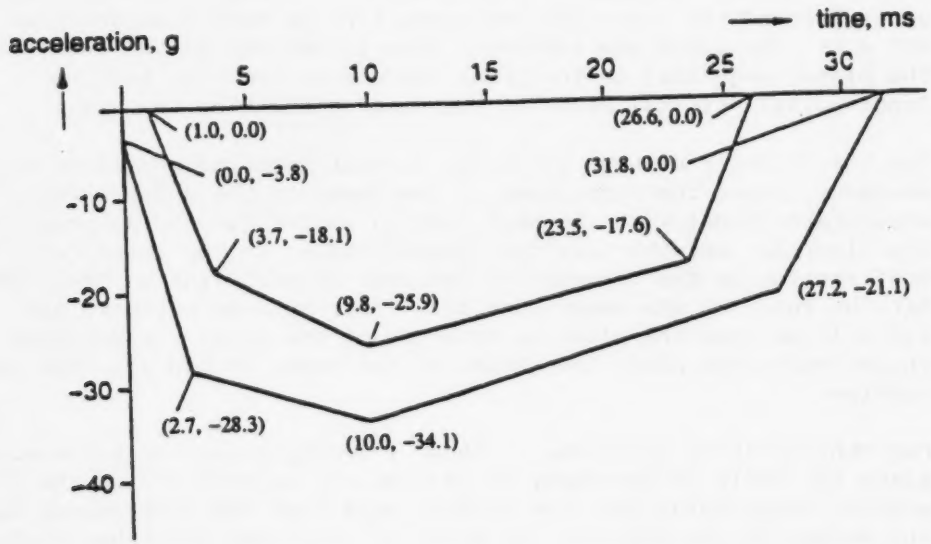


Figure 6 - PENDULUM DECELERATION-TIME CORRIDOR FOR LUMBAR SPINE CERTIFICATION TEST



Annex 7

INSTALLATION OF THE SIDE IMPACT DUMMY

1. GENERAL

1.1. The side impact dummy to be used for the following installation procedure is described in annex 6 of this Regulation.

2. INSTALLATION

2.1. Adjust the leg joints so that they just support the leg when it is extended horizontally (1 to 2 g).

2.2. Clothe the dummy in form-fitting cotton stretch underwear with short sleeves and mid-calf length pants. Each foot is equipped with a shoe.

2.3. Place the dummy in the outboard front seat of the impacted side as described in the side impact test procedure specification.

2.4. The plane of symmetry of the dummy shall coincide with the vertical median plane of the specified seating position.

2.5. The pelvis of the dummy shall be positioned such that a lateral line passing through the dummy H-points is perpendicular to the longitudinal centre plane of the seat. The line through the dummy H-points shall be horizontal with a maximum inclination of ± 2 degrees.

2.6. The upper torso shall be bent forward and then laid back firmly against the seat back. The shoulders of the dummy shall be set fully rearward.

2.7. Irrespective of the seating position of the dummy, the angle between the upper arm and the torso arm reference line on each side shall be 40° ± 5°. The torso arm reference line is defined as the intersection of the plane tangential to the front surface of the ribs and the longitudinal vertical plane of the dummy containing the arm.

2.8. For the driver's seating position, without inducing pelvis or torso movement, place the right foot of the dummy on the undepressed accelerator pedal with the heel resting as far forward as possible on the floorpan. Set the left foot perpendicular to the lower leg with the heel resting on the floorpan in the same lateral line as the right heel. Set the knees of the dummy such that their outside surfaces are 150 ± 10 mm from the plane of symmetry of the dummy. If possible within these contraints place the thighs of the dummy in contact with the seat cushion.

2.9. For other seating positions, without inducing pelvis or torso movement, place the heels of the dummy as far forward as possible on the floorpan without compressing the seat cushion more than the compression due to the weight of the leg. Set the knees of the dummy such that their outside surfaces are 150 ± 10 mm from the plane of symmetry of the dummy.

Annex 8

PARTIAL TEST

1. PURPOSE

The purpose of these tests is to verify whether the modified vehicle presents at least the same (or better) energy absorption characteristics than the vehicle type approved under this Regulation.

2. PROCEDURES AND INSTALLATIONS

2.1. Reference tests

2.1.1. Using the initial padding materials tested during the approval of the vehicle, mounted in a new lateral structure of the vehicle to be approved, two dynamic tests, utilizing two different impactors shall be carried out (figure 1).

2.1.1.1. The head form impactor, defined in paragraph 3.1.1., shall hit at 24.1 km/h, in the area impacted for the EUROSID head during the approval of the vehicle. Test result shall be recorded, and the HPC calculated. However, this test shall not be carried out when, during the tests described in annex 4 of this Regulation:

where there has been no head contact, or
when the head contacted the window glazing only, provided that the window glazing is not laminated glass.

2.1.1.2. The body block impactor, defined in paragraph 3.2.1., shall hit at 24.1 km/h in the lateral area impacted by the EUROSID shoulder, arm and thorax, during the approval of the vehicle. Test result shall be recorded, and the HPC calculated.

2.2. Approval test

2.2.1. Using the new padding materials, seat, etc. presented for the approval extension, and mounted in a new lateral structure of the vehicle, tests specified in paragraphs 2.1.1.1. and 2.1.1.2., shall be repeated, the new results recorded, and their HPC calculated.

2.2.1.1. If the HPC calculated from the results of both approval tests are lower than the HPC obtained during the reference tests (carried out using the original type approved padding materials or seats), the extension shall be granted.

2.2.1.2. If the new HPC are greater than the HPC obtained during the reference tests, a new full scale test (using the proposed padding/seats/etc.) shall be carried out.

3. TEST EQUIPMENT

3.1. Head form impactor (figure 2)

3.1.1. This apparatus consists of a fully guided linear impactor, rigid, with a mass of 6.8 kg. Its impact surface is hemispherical with a diameter of 165 mm.

3.1.2. The head form shall be fitted with two accelerometers and a speed-measuring device, all capable of measuring values in the impact direction.

3.2. Body block impactor (figure 3)

3.2.1. This apparatus consists of a fully guided linear impactor, rigid, with a mass of 30 kg. Its dimensions and transversal section is presented in figure 3.

3.2.2. The body block shall be fitted with two accelerometers and a speed-measuring device, all capable of measuring values in the impact direction.

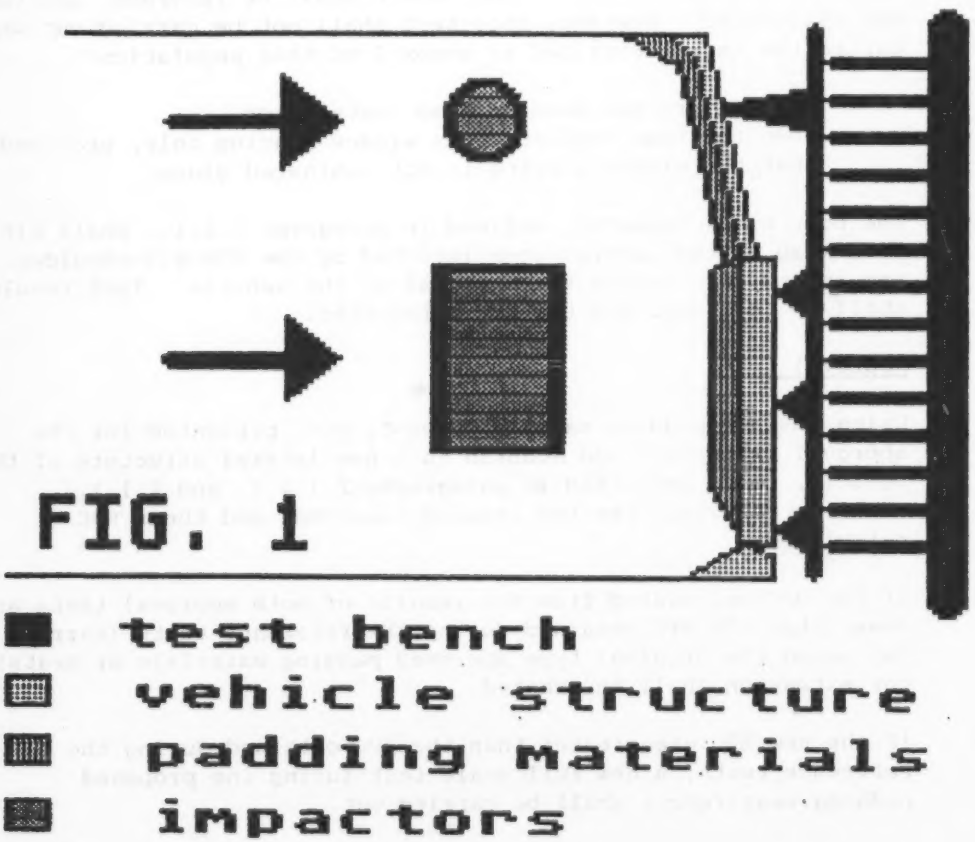


FIG. 1

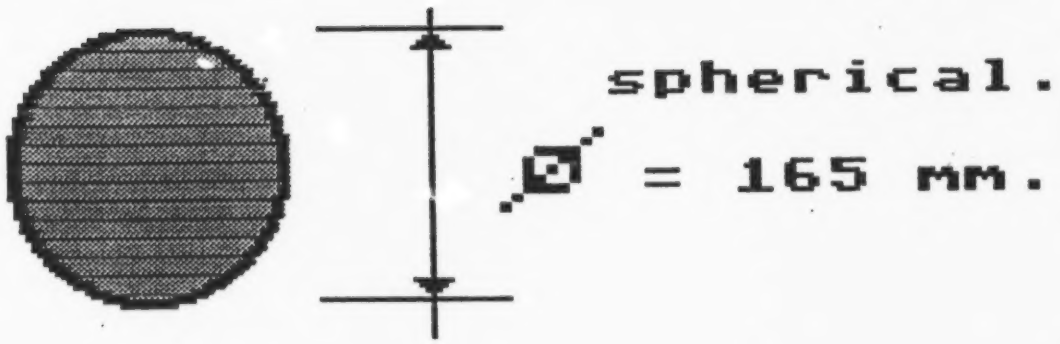


FIG. 2

head form impactor

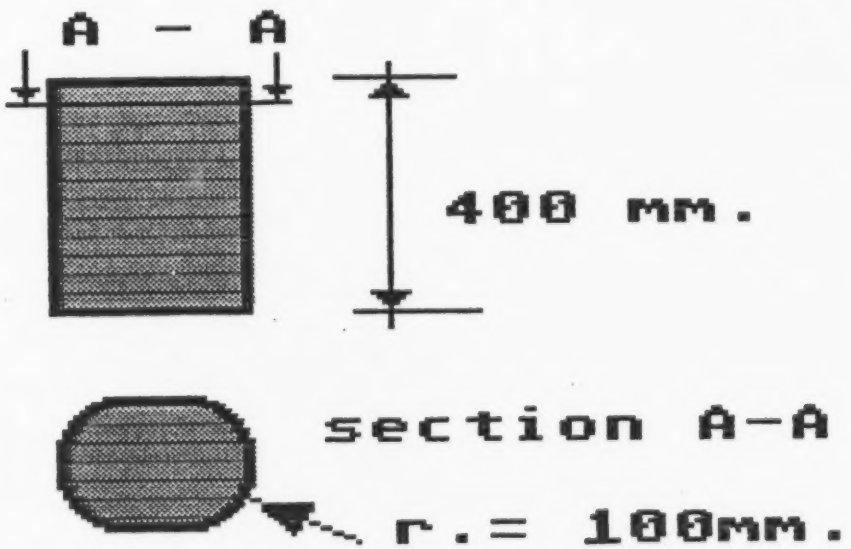


FIG. 3

body block impactor